A SPELLING-BASED PHONICS APPROACH TO WORD INSTRUCTION FOR CHILDREN WITH DOWN SYNDROME

A Dissertation
by
AMY RENEE WILLIAMS

Submitted to the Graduate School
Appalachian State University
in partial fulfillment of the requirements for the degree of
DOCTOR OF EDUCATION

August 2010
Doctoral Program in Educational Leadership

A SPELLING-BASED PHONICS INSTRUCTION STRATEGY TO WORD INSTRUCTION IN CHILDREN WITH DOWN SYNDROME

A Dissertation
by
AMY RENEE WILLIAMS
August 2010

APPROVED BY:

David A. Koppenhaver, Ph.D
Chairperson, Dissertation Committee

Morgen I. Alwell, Ph.D
Member, Dissertation Committee

Robert C. Schlagal, Ph.D
Member, Dissertation Committee

Woodrow R. Trathen, Ph.D
Member, Dissertation Committee

Jim Killacky, Ed.D
Director, Doctoral Program

Edelma D. Huntley, Ph.D
Dean, Research and Graduate Studies

ABSTRACT

A SPELLING-BASED PHONICS INSTRUCTION STRATEGY TO WORD INSTRUCTION IN CHILDREN WITH DOWN SYNDROME
(August 2010)

Amy Renee Williams, B.S. Appalachian State University

M.A. Appalachian State University

Dissertation Chairperson: David Koppenhaver

Word instruction for children with Down syndrome (DS) has historically consisted of sight word approaches. While there have been several accounts of children with DS learning to read, the majority of the sight word research has lacked any sort of measure of application to the student's environment. While sight words are important, a lack of phonics instruction results in a child being unable to read and spell unfamiliar words.

This exploratory case study examined the effects of a spelling-based phonics approach to word instruction with four participants. Each high-school aged participant attended a separate school. Data were collected at pre- and posttest, at weekly periodic checks, and daily. Measures examined the ability of the participants to read and spell words with high frequency patterns, growth and development of phonemic awareness and orthographic knowledge, and understanding of the steps of the strategy itself.

With beginner level skills measured, the participants received 23-24 lessons in *Making Words*. This instruction is based on the use onsets and rimes. Each lesson consisted

of (a) the use of a limited set of letters to make words with high frequency patterns, (b) visual sorting of the words, and (c) the use of these words to spell unfamiliar words.

Results demonstrated that the participants seemed to understand the steps to Making Words. Similar to children who are typically developing, the participants seemed to make subtle advancements in their ability to read and spell words over the course of the study.

DEDICATION

This work is dedicated to the teachers of exceptional children who believe in and focus on the abilities of their students rather than the disabilities. All children can learn to read and write. We, as educators, must think without limitations, and teach our students.

ACKNOWLEDGEMENTS

First, I owe a lifetime of thanks to Dave Koppenhaver. It has been an incredible opportunity to work with someone that believes in the literacy abilities of all kids, and particularly, children with exceptionalities. You've provided me with guidance each step of the way and opened my mind to the possibilities of the future.

Thank you to my mom, dad, and sister. You continue to support me in all my adventures, including this one.

Many thanks to my supportive friends: Roxanne, Jenny, Adam, Gary, Kathy, Leah, Tracy, George, and Emily. All of you have been my cheerleaders. I hope I can return the favor in the future.

Thank you to Morgen Alwell, Bob Schlagal, and Woody Trathen. Each of you have inspired me by your teaching and research.

I have valued each opportunity to work with children and their parents as a teacher of exceptional children. Thank you for sharing your children with me and thank you for inspiring me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Children with Down syndrome (DS) experience significant difficulties in learning to read. A number of reasons have been proposed for these difficulties, including a widely held belief that such children cannot learn phonics. In this chapter, a case for word instruction of children with DS is developed. First, federal legislation that has led to the right for education, is reviewed. Next, a description of prominent instructional philosophies for children with intellectual disabilities is presented. The case for literacy instruction for children with DS is then examined, along with characteristics of the disability itself. The implications for educational administrators and teacher preparation programs are considered. With word instruction representing one component of a comprehensive approach to literacy instruction, the need for additional research in the area of phonics is supported.

Federal Mandates

Historically, children with disabilities have been excluded from public schooling. In 1975, the United States Congress passed Public Law 94-142, the Education for All Handicapped Children Act, allowing access to public education for the first time for many children with disabilities. Since 1975, the Act has gone through several revisions and reauthorizations; it was renamed the Individuals with Disabilities Education Act (IDEA) in 1990, and most recent revisions were made in 2004. Under IDEA, states are required to develop and implement policies that assure a free and appropriate public education to all

children, specifically those who experience disabilities (U. S. Department of Education, 2007).

In the nearly 30 years since its passage, one of the key tenets of the law, education in the least restrictive environment (LRE), has been the source of much debate; the current IDEA Improvement Act of 2004 states that all children, regardless of disability, must receive instruction in the general education curriculum. This paralleled the movement over the past half century or so emphasizing increased membership and belonging in inclusive school and community environments for children and youth with disabilities (Friend & Bursuck, 2002). For students with disabilities and academic difficulties, literacy capabilities play a central role in their success in inclusion (Farrell & Elkins, 1994/1995). Improving the literacy skills of children with disabilities will arguably lead to more meaningful participation and greater achievement in inclusive environments and, most importantly, greater quality of life.

Instructional Philosophies

Since the passage of federal mandates, children with disabilities have been taught in both separate classrooms and separate schools. More recently, an increasing number of students have received services in inclusive environments (Downing, 2005). Within each of these settings, there are prominent literacy approaches that have emerged.

One such approach is a functional literacy curriculum. The tenets of this curriculum consist of (a) students reading sight words that are intended to have immediate use in the environment, (b) students learning functional reading skills involved in daily life, and (c) teachers providing quick success to students in reading skills that can have immediate and long term use. Each of these skill emphases may lead to more elaborated literacy instruction (Browder, 2001). However, the skills are often taught in isolation and with limited

application (Browder, Courtade-Little, Wakeman, & Rickelman, 2006). An assumption is made that students will be able to generalize their learning to home, work, and community settings. This approach draws criticism because skills considered functional for one child (i.e., recognizing community-based words such as "exit" or "women" or use of the telephone book) may not be functional for another child (Katims, 2000).

A second approach is a traditional literacy curriculum. Similar to the functional curriculum, the focus of instruction remains on personal, social, and vocational skills, but emphasizes repetitive, isolated drill and practice with decontextualized pieces of information (Katims, 2000). The traditional approach to instruction operates from the perspective that students must be taught a linear set of subskills to mastery (p. 3). This approach draws criticism due to its isolated approach to instruction. This approach rarely uses connected text, and does not consider the difficulties that may incur when students are not taught a context for skill application. The traditional approach has a foundation in behaviorism, and reduces student opportunities to understand how literacy can be used as a tool for (a) increasing communication, (b) providing recreation, and (c) acquiring information (Katims, 2000).

A third approach is comprehensive literacy instruction, also referred to as a progressive approach to instruction (Downing, 2005; Katims, 2000). This integrated and constructivist type of instruction is more commonly found in regular education and less frequently used with children with intellectual disabilities. A comprehensive approach maintains the premise that students need instruction not only in basic word level skills, such as phonological awareness and sight word instruction, but also in text level skills, such as comprehension and composition, and in application of those skills through shared and

independent reading and writing experiences (Downing, 2005). Within a more comprehensive approach, instruction occurs within the larger context of reading and writing rather than in practice isolated from meaningful context. The instructional environment allows children the opportunity to interact with and construct text with a focus on gaining meaning from print (Katims, 2000). While a number of instructional approaches in special education have been utilized, a comprehensive view of literacy has shown promise with children with intellectual disabilities, including DS (Hedrick, Katims, & Carr, 1999).

Literacy and Down Syndrome

The ability to read is paramount in today's society, particularly for the individuals with disabilities. Reading and writing serve as acts of communication similar to the acts of talking and listening (Francis, 1982). For individuals with disabilities, and specifically DS, literacy affords a life of greater independence. Both reading and writing are daily life skills that can provide not only recreational roles in an individual's life but can also serve as a catalyst for developing and maintaining relationships (Moni & Jobling, 2000). As one young man with DS noted in Oelwein (1995), "When you can read, you can go anywhere and do anything" (p. 2).

One of the earliest documented accounts of teaching a child with DS to read was that of Nigel Hunt in the 1960s (Hunt, 1967). Soon after Nigel learned to talk, his mother began to sound out words for him. She would choose everyday objects in their home and Nigel would repeat the sounds and words back to her. She also tried a sight word approach but found that Nigel was more successful with the phonics-based method. Nigel described his mother's process in this manner: "After I had learned the sound of every letter mother held things up and sound-spelt them like 'This is a C-U-P' and soon I could do it all by myself"

(Hunt, 1967, p. 98). He read his first basic reader at about five years of age. His literacy abilities expanded throughout his school years. His father, a writer himself, taught Nigel how to use his typewriter and eventually bought one for him. His father suggested writing a journal. This autobiography became the first book to be written by an individual with DS, *The World of Nigel Hunt: The Diary of a Mongoloid Youth* (1967).

Down Syndrome

First described by English doctor John Langdon Down in the late 1800s, Down syndrome (DS) is one of the most commonly occurring genetic conditions, representing 5,000 births per year in the United States (National Down Syndrome Society, 2008). DS is caused by a genetic abnormality that results in an extra chromosome, referred to as Trisomy 21. Considered the most common cause of intellectual disability, DS was once perceived to be exclusively a severe intellectual disability. Children born with DS were frequently institutionalized and given little, if any, opportunity for education (Seltzer & Krauss, 1999).

A number of developmental characteristics of DS have been identified. Researchers have commonly noted relative strengths in social communication and visual-spatial function (Fowler, 1990; Patterson & Lott, 2008). In contrast, deficits have been associated with (a) language development, both receptive and expressive measures; (b) motor issues, particularly those associated with articulation; and (c) hearing impairments due to a greater frequency of ear infections (Fowler, 1990; Meyers, 1990; Patterson & Lott, 2008). Language delays are most frequently found in grammar production and development rather than vocabulary or lexicon (Fowler, 1990).

Cognitive difficulties in DS seem to affect verbal memory as well as the acquisition and use of linguistic structures (Fowler, 1990). Phonological memory is the ability to encode

and reproduce visual or oral information within a phonological processor; it is represented by verbal and short-term auditory memory (Fowler, Doherty, & Boynton, 1995). Linguistic structures represent phonology, syntax, and morphological components (Fowler, Doherty, & Boynton, 1995). Although not with the same level of predictive power as phonological awareness, verbal short-term memory and word retrieval have been found to co-vary with reading skill (Fowler et al., 1995). While children who are typically developing are able to learn memory strategies incidentally, children with DS are unable to do so and do not readily memorize and learn new information in a manner that encourages recall (Broadley & MacDonald, 1993). These difficulties make literacy acquisition more challenging for an individual with DS.

Significance for Educational Leadership

Providing high-quality education for all students should be a top priority for all administrators. This is particularly important for children with intellectual disabilities, who often begin and continue school at academic levels significantly behind those of their peers. Better understanding what quality word instruction looks like will enable administrators to make more informed decisions in their own schools.

In addition, this study potentially has significance for teacher preparation programs in colleges and universities. Pre-service teachers need a deep understanding of the various methods of beginning reading instruction anchored in sound theoretical models. This study explores one such example of beginning word instruction. It may provide a model for a process that educators can engage in to better determine how to teach challenging students such as those with DS to read.

Purpose of the Study

Through word instruction, children build their ability to not only recognize a word as a whole, but also break the words into parts. One way to teach these parts is through phonics. With the ability to decode words, children can read and spell words in their oral language vocabulary more generatively and not have to rely on memorization. While the literature on effective instructional strategies for beginning and emergent readers is robust, the body of research in phonics instruction for children with DS has remained quite limited. The purpose of this study was to examine the effects of a phonics approach to word instruction in children with DS. In this study, a spelling-based phonics approach, *Making Words* (Cunningham & Hall, 1994, 2009), was used to teach high frequency rime patterns. Through implementation of a sequence of lessons, this study examined the effects of this approach on participants' reading and spelling of taught and untaught words containing high and low frequency rime patterns.

Summary

With the advent of inclusive education and greater access to high quality literacy instruction, students with disabilities have unprecedented learning opportunities. Indeed, there seems to be no just rationale for not providing phonics instruction to students with cognitive disabilities, and particularly those students with DS, from phonics instruction. Phonics instruction represents one component of comprehensive literacy instruction that contributes to the ultimate goal of students who read and write independently. With the ability to decode, students are able to read and spell unfamiliar words with a greater accuracy. Evidence is needed on how best to provide this form of instruction. By

documenting gains in skill acquisition during *Making Words* lessons, this study represents an initial attempt to gather such evidence.

This dissertation is organized in the following way. Following this introductory chapter, chapter 2 provides a review of the word instruction literature in special education and a discussion of how children to read. Chapter 3 then describes the methods employed in conducting this case study. Chapter 4 presents the results of the intervention study. Finally, implications of the study are discussed in chapter 5.

CHAPTER 2

LITERATURE REVIEW

Introduction

To better understand how the fields of literacy and special education converge in instruction for individuals with DS, a review of the literature was completed. In this review, literacy instruction for children with DS was divided into four areas: (a) comprehensive instruction, (b) sight word approaches, (c) phonics instruction, and (d) phonological awareness instruction. The theory that cognitive processes in learning to read are inherently the same in all individuals is supported within a review of understandings of the mature reader as well as the beginning reader. The mature reader provides perspective on the skills that must be learned by the beginning reader. With phonics approaches often found in regular education, it seems reasonable to explore these possibilities further in special education which has historically has had a limited view of the literacy learning potential of individuals with DS.

Comprehensive Literacy Instruction in Children with DS

There are few intervention studies that have examined comprehensive approaches to literacy instruction for children with intellectual disabilities. An exception to this trend is a study by Hedrick, Katims, and Carr (1999) in which a year-long, academically oriented literacy program was implemented for children with mild to moderate intellectual disabilities, including three students with DS. The elementary-aged students were taught in a self-contained classroom. They participated in four separate 45-minute blocks of instruction that

included writing, self-selected reading, guided reading, and word instruction. In particular, the goals of word instruction were to familiarize students with high-frequency sight words and highly regular phonetic patterns. High frequency sight words were displayed on a word wall and daily activities utilizing these words were a part of this instruction. Decoding activities involved guided spelling of words with highly regular phonetic patterns. Children sorted the resulting words by pattern and then used the word patterns to spell new words sharing the patterns. While the descriptive study did not separate out the results of the students with DS, measures of automatic word identification indicated measurable progress for all students. The behavior of students when encountering an unfamiliar word was also noteworthy. During pretests, students seemed uncertain about what to do when encountering an unfamiliar word. At posttests, most of the students attempted to decode unfamiliar words. Overall, the three students with the lowest IQ scores, ranging from 55-76, made the greatest gains in answering comprehension questions, naming words in isolation, and reading words in context (Hedrick et al., 1999).

While the aim of another research project was not instruction of children, Farrell and Elkins (1994/1995) monitored the development of children with DS participating in a longitudinal study. They found that several children demonstrated a progression in phonemic awareness over time. In addition, the children learned to successfully apply the alphabetic principle in reading and writing as well as attend to components of words, including consonant blends and syllables.

Sight Word Instruction in Children with DS

While some researchers believe that an initial base of sight words may be necessary, they argue that sight word instruction alone will not lead to independent reading ability (van

Bysterveldt, Gillon, & Moran, 2006). Other researchers, however, continue to advocate for this approach. Buckley (1995) concluded that the vocabulary size for a child with DS is limitless when using the *look-say* method and suggested that no letter-sound knowledge would be necessary, as long as someone was available to teach each new word to the child. At best, this suggestion is impractical in educational settings and stands in conflict with current research on literacy acquisition. Buckley's rationale for sight word reading instruction is based on the belief that the language skills of children with DS develop in a different order and require different strategies from children who are typically developing (Buckley, 1985). This view contrasts sharply with other models of word learning (e.g., Ehri, 1989, 1998; Morris, Bloodgood, Lomax, & Perney, 2003, Perfetti, 1985).

Sight word approaches do not teach words as part of an alphabetic system in which words are decodable or encodable, but instead, as whole units. Such approaches often revolve around specific lists of words that have been deemed functional words for daily living. Sight word approaches were common in the early 1970s and remain prominent in special education classrooms (Conners, 1992). Indeed, Browder and Xin (1998) cite an increase in inclusion opportunities as one rationale for renewed attention to sight word research. Sight word instruction is one form of instruction implemented with students in general education and with an increase in functional academics can lead to increased participation (Browder & Xin, 1998).

A basic sight word vocabulary has been defined as words that a child can recognize without phonetic analysis (Browder & Lalli, 1991). While data were not disaggregated for children with DS, four reviews that were identified that included children with intellectual disabilities, encompassing children with DS. A review by Browder and Lalli (1991) focused

on studies of individuals with moderate and severe disabilities. A review by Browder and Xin (1998) included studies of all individuals with disabilities. Conners' (1992) review examined studies of reading instruction with children with moderate intellectual disabilities, and included a review of sight word approaches that have been completed in the previous two decades. Finally, Erickson, Koppenhaver, and Yoder (1994) reviewed literacy studies in adolescents and adults with intellectual disabilities within their review of literacy research in developmental disabilities. Each of these reviews is discussed below.

Browder and Lalli (1991) examined studies over a 20-year time span that used a behavioral orientation to sight word instruction due to its frequent use with all individuals with disabilities and the precise nature of this type of sight word instruction. The behavioral approach to sight word instruction required that the child not only be able to identify taught words in training conditions but also generalize the words to other settings (Browder & Lalli, 1991). These studies included subjects diagnosed with an array of disabilities, including emotional disturbance, learning disabilities, and intellectual disabilities.

Twenty-two sight word studies fell into the categories of either errorless learning or trial and error learning. Errorless learning, also referred to as errorless procedures or antecedent stimulus control, teaches words through a process of modeling and emphasizing the correct answer to the student. Time delay, stimulus fading, and prompt elimination are methods for fading an added stimulus in the errorless learning process. As well, stimulus shaping, where distracters are arranged in an easy to difficult sequence, is considered an errorless learning procedure.

Trial and error learning includes *look-say* or *look-point* procedures that rely exclusively on verbal reinforcement as feedback (Browder & Lalli, 1991). The student is

presented with the visual stimulus and then instructed to make the reading response. If a *look-say* procedure is used, the student is presented with the visual stimulus and asked to say the target word. If a *look-point* procedure is used, the student is presented with the visual stimulus and asked to point to the target word. Feedback after the student response may include verbal praise and error correction procedures.

In their review, Browder and Lalli (1991) found that the chosen procedure (i.e., whether *look-say* or *look-point*) was effective for teaching the words in isolation. Generalization measures were found in 12 studies in the form of vocabulary understanding. This was assessed by asking students to match a word to a picture or to find the taught word on an item in a daily living activity. Browder and Lalli (1991) suggested that future studies make a clearer distinction in the goal of sight word instruction, either academic or functional, so that experimental methods can account for this goal.

In a meta-analysis by Browder and Xin (1998) 32 sight word studies were examined in order to (a) better understand the impact of teaching functional reading, (b) provide a review that included all individuals with disabilities, (c) examine the volume of studies since previous reviews, and (d) provide a different form of analysis that can provide insight on the generality of treatment effects. While the age of individuals was not restricted, additional criteria for inclusion in the review did include the use of experimental design with a minimum of two replications or one comparison/control. Functional reading was defined in terms of the application of literacy knowledge to life skills, such as reading words on a bank machine or reading a grocery list.

The meta-analysis determined overall treatment effectiveness based on a procedure using the percentage of nonoverlapping data points. The median percentage of

nonoverlapping data points was 91, with a range of 63-100, which meant that there was little overlap between baseline and treatment phases. Browder and Xin (1998) suggested that the score of 91 was indicative of considerable treatment effects. The various forms of sight word instruction were effective for individuals with moderate and severe disabilities, and particularly effective for individuals with mild disabilities, although studies with this population were fewer in number. While the authors noted that most of the studies had zero baselines, possibly influencing the high effect sizes found in these studies, each study taught the words to mastery, seeming to indicate rapid word acquisition.

The meta-analysis also found (a) variation in traditional teaching interventions, (b) changes in instruction, and (c) limitations for generalization. Several reviewed studies used altered traditional teaching techniques. Instructional feedback took a different role in many studies, including its use for teaching sight words as well as a way to provide more elaborate student feedback. For example, various students required students to draw, trace, and repeat missed words. Many of the studies showed the effectiveness of the use of time delay, a form of errorless learning. Its application and data collection required no special materials. In this type of instruction, students were presented with the stimulus and a pause occurred before the instructor provided the response. The majority of the studies used time delay procedures and reinforcement in the form of verbal praise, token, or tangible reinforcement. Contrary to what was expected by the researchers, the analysis revealed that methods using strategies such as corrective feedback were more effective than errorless learning methods, such as time delay (Browder & Xin, 1998).

Several studies included application activities that explored the functional use of the sight word. However, measures or demonstrations of these skills were often lacking in the

studies. Similar to Browder and Lalli's (1991) finding, measures of generalization for word learning were limited in this review. Browder and Xin (1998) found only four studies that included application activities.

In her review of studies in children with moderate intellectual disabilities, Conners (1992) examined not only sight word studies but also areas that had begun to draw the attention of researchers: phonics-based instruction and oral reading error-correction (for further information on this aspect of the review, see the section, Phonics Approaches to Word Instruction in Children with DS- page 18). Unlike the two previous studies, this review sought to focus specifically on one population. In addition, only studies that taught systematically using a standard orthography and reported outcome measures were included in the review.

Conners (1992) found that three sight word instructional approaches have been studied extensively and the 17 studies used one of three techniques: delay, picture integration, or errorless discrimination. Researchers using delay techniques, including constant time delay and progressive delay, have taught sight words to children and adults. Constant time delay was noted as a more time-efficient method of instruction than progressive delay. Picture integration included both fading techniques as well as picture integration techniques. Picture fading incorporated the use of a picture to support initial understanding of the written word. Over time, the picture was removed. This method proved more effective than paired-associates method, where the picture and word are paired continually throughout instruction. Picture integration incorporated the word and the picture together. For example, the word *snake* might be written in letters that are colored and drawn to resemble a snake. This word would be incorporated with the standard written word for

instruction. However, when compared with the Edmark Reading Program (1972), which does not use pictures but instead nonwords and words that gradually appear similar to the target word, Edmark proved to be a more effective strategy. Both constant delay and Edmark seemed to have practical benefits over the other methods due to the limited amount of materials necessary and the potential application to a wide range of words.

Erickson, Koppenhaver, and Yoder (1994) reviewed literacy research on adolescents and adults with developmental disabilities. One section of the review focused on studies of individuals with intellectual disabilities. Of the 14 studies reviewed, the bulk of the work focused on sight word learning through the use of prompting, positive reinforcements, time delay, fading techniques, stimulus discrimination, and combinations of one or more of these methods. An exception to this line of research was three studies that included the use of technology and computerized instruction. Due to differences in learning styles of the individuals, the researchers concluded that the principles of individualized instruction remained a crucial piece of the instructional model (Erickson, et al., 1994).

Practitioners have implemented sight word instruction with two particular approaches with children with DS. The first approach, the Edmark Reading Program (1972), teaches sight words through use of a technique that is similar to picture fading (See Appendix A for a sample lesson adapted from the Edmark Reading Program). First, the target word is shown to the child as the instructor orally identifies the word. The child is asked to repeat the word orally and point to the word a number of times. Rather than pictures, a series of letter strings are used as distracters as children are asked to point to the target word. The letter strings become progressively more similar to the target word. When compared with picture fading

techniques, Walsh and Lamberts (1979) found Edmark to be a more effective method for teaching words due to the attention placed on the orthographic components of the words.

A second approach is found in Oelwein's (1995) *Teaching Reading to Children with Down Syndrome: A Guide for Parents and Teachers*, one of the most widely recognized texts used by parents and teachers for literacy instruction. Oelwein, a former teacher and creator of the reading program described in her book, maintains an instructional philosophy that *most* children with DS can learn to read.

Oelwein suggested using her text as a beginning reading program, a supplemental program, or as the only reading program for the child. The text is described as an individualized, language-experience, functional reading program. Functional words are those that she believes will serve a purpose in daily activities for most children, including colors, animals, feelings, household items, and actions. Each of these themes or topics represents units in the text. She describes how to teach sight words, alphabet, phonics, writing, and spelling, although most areas are taught concurrently. For example, as sight words are learned, children can begin to also learn the names of the beginning letter of each sight word. Once children have a sight word vocabulary and some alphabet knowledge, the child can begin to learn letter sounds and read word families according to Oelwein. Consequently, children can be taught spelling once letter names are learned. Matching, selecting, and naming methods are used to teach each skill.

Oelwein (1995) suggested teaching sight words by first matching one to another. Then, the child must learn to select the target word when the teacher provides a verbal prompt. Finally, the child must be able to read the written word. After the child is taught to successfully read some sight words in isolation, in books and in game format, alphabet and

letter sounds are taught. Alphabet instruction begins by making use of the sight words that child knows. For example, the teacher might use the first letter of the child's name and the first letter of family members' names as upper and lower case letters are taught using the match, select, and name sequence. Once the child is able to read about 50 to 100 sight words and knows most of the alphabet letters, phonics is taught. Phonics are taught through initial consonant sounds added to a word family base while spelling instruction begins with teaching children to spell their names, and then proceeds to using words from a spelling program that is used with other students or words that have been deemed as the most functional for the child. Games and activities are incorporated in order to aid fluency, comprehension, transfer, and generalization of the words.

In summary, research in sight word instruction has shown that individuals with DS can learn to identify the targeted words. Instruction has predominantly consisted of behavioral techniques. One issue in the literature is the lack of generalization measures. An over-reliance on visual strategies for learning whole words does not draw attention to the orthographic structures which are ultimately required to reach the lexicon (Ehri, 1992).

Phonics Approaches to Word Instruction in Children with DS

The number of studies that have examined approaches commonly found in regular education has grown slowly. Two separate literature reviews have examined phonics in the field of special education. Conners (1992) used the same review criteria for studies using word analysis as for studies of sight words that were previously described. Seven studies that used letter-sound correspondences in their instruction were found. Each study integrated behaviorally-based approaches to their instruction, including time-delay and stimulus-

connected prompt-fading techniques. Four studies evaluated phonics programs and three studies examined letter sounds and blending.

The phonics programs included two studies that evaluated the effectiveness of the Distar Reading Program (Engelmann & Bruner, 1969; Engelmann & Stearns, 1972) over two years (Bracey, Maggs, & Morath, 1975) and over a five-year period (Gersten & Maggs, 1982) in children with intellectual disabilities. Distar is designed in a sequence that requires mastery of one step before advancing to the next while using error-correction techniques, cuing, and token reinforcements. Bracey et al. demonstrated gains in blending and segmenting, letter-sound correspondence, and sounding out words when six children received15 to 30 minutes of instruction for two years. None of the children could read words in isolation at the beginning of this study. However, gains may be due to other factors, including maturation. Additional issues include a lack of a control group and control condition (Conners, 1992).

Gersten and Maggs (1982) conducted a five year study on the effects of the Distar Reading (Engelmann & Bruner, 1969; Engelmann & Stearns, 1972) and Distar Language (Engelmann & Osborn, 1969, 1971, & 1972) programs on the reading and language skills of 12 children with moderate intellectual disabilities. At the completion of the study, reading and comprehension averaged early third grade for the students. However, it is difficult to determine causation due to a number of influences, including: (a) phonics instruction being one piece of the reading and language program, (b) intelligence scores of the participants increasing beyond what would be statistically expected over the time period of the study, and (c) general familiarity with the program itself influencing some of the increases (Conners, 1992).

Of the letter-sound and blending studies, Hoogeveen and his colleagues (Hoogeveen, Kouwenhoven, & Smeets, 1989; Hoogeveen & Smeets, 1988; Hoogeveen, Smeets, & Lancioni, 1989; Hoogeveen, Smeets, & van der Houven, 1987) successfully taught letter-sound correspondences and phoneme blending to syllables and demonstrated generalization to untrained items by combining various behavioral techniques to the interventions with children with intellectual disabilities.

More recently, Joseph and Seery's (2004) review, appropriately titled, *Where is the Phonics*, examined research that incorporated phonetic analysis or phonics instruction over a 12-year period of time from 1990 to 2002, as an update of the review conducted by Conners (1992). Studies in their review (a) examined learning in children with mild to moderate intellectual disabilities only, (b) did not include studies of letter recognition only or phonemic awareness only, and (c) were published in peer-reviewed journals. Seven studies examined the use of letter-sound correspondences. While no studies were found that examined the effectiveness of direct or explicit phonics instruction, seven studies were found that incorporated the use of phonics. Together, the two reviews have examined research over a 34-year time frame and found few studies relative to the number of sight word studies. Both Conners (1992) and Joseph and Seery (2004) concluded that further studies of phonics-based approaches were warranted. Word instruction methods for children with intellectual disabilities have traditionally focused on sight word instruction. A few studies represent exceptions to this pattern and offer further evidence supporting the abilities of children with DS to learn phonics. One tutoring program incorporated the National Reading Panel's (National Institute of Child Health & Human Development, 2000) five essentials to teaching children to read (i.e., phonological awareness, phonics, fluency, vocabulary, and

comprehension) and used curriculum-based measurement to track progress (Al Otaiba & Hosp, 2004). For 10 weeks, pre-service teachers tutored four students with DS, ages 7 to 12 years. Each student had an individualized education plan that consisted of instruction in: (a) phonological awareness for 5-10 minutes, (b) phonics for 5-10 minutes, (c) sight-word fluency games for 5 minutes, (d) vocabulary and comprehension for 20 minutes, and (e) weekly progress monitoring for 5 minutes. For the pre- and post-test, a standardized test was used that measured word identification, or reading words in isolation, and word attack, or decoding nonsense words. Phonological awareness and phonics materials from regular education were used for instruction. Assessments varied per student, depending on their pre-test scores. Results showed that all but one student made gains between seven months and over three years in decoding. In regard to word reading, one student made over a year's gain, one made over four months growth, and two made very little progress.

A second study described a phonics instructional program implemented with a young adult, Gordon, with DS. Morgen, Moni, and Jobling (2006) based the instruction on three strategies: personalizing the instruction, motivating the student, and using multiple activities and strategies for phonics instruction that incorporated the needs, interests, and abilities of the student. The instruction was then framed within the context of a literacy model found within Australian education systems and others that emphasized letter-sound relationships, grammar, spelling, syntax, and conventions; knowledge of various genres and how each can change based on audience, context, or purpose; role of prior knowledge and personal experience in constructing meaning from texts; and critical thinking, reading, writing, speaking, and viewing. Prior to instruction, Gordon knew 14 letter names and sounds, could identify and spell about five words with vowel blends and phonograms, and could read and

spell four word family endings. One example of an activity that incorporated the letters and sounds that he didn't know was a thematic alphabet scrapbook. Since Gordon enjoyed learning about dogs, photos were collected, and words that represented different aspects of owning a dog were written in the book for each alphabet letter. For example, the words, *games, guards,* and *good* were written for the letter, *g*. This book was also used to support his writing. At the end of the semester-long program, Gordon knew 22 alphabet letter names and sounds, and understood nine word endings, 10 phonograms, and 10 consonant blends (Morgen et al., 2006).

An intervention study by Cupples and Iacono (2002) compared sight word instruction with analytic reading instruction. Seven children participated in the study that consisted of one intervention session a week for six weeks. Using software designed specifically for this study, four children received intervention in onset/rime instruction while three children received sight word instruction. The children participated in pre-intervention and post-intervention tasks that consisted of: phoneme blending of real words, phoneme blending of nonwords, phoneme segmentation of real words, and phoneme segmentation of nonwords. Five words containing high frequency rimes, such as –ig or –en, were trained during each session. The whole word intervention required children to: (a) name pictures, (b) match pictures to written words, (c) match written words to spoken words, (d) read individual words, and (e) finish a sentence completion activity. Children engaged in the word analysis intervention were instructed to: (a) select pictures representing words that have the same rimes, (b) spell the item in the picture by selecting the appropriate onset to combine with the given rime, (c) identify the initial sounds of the spoken word, (d) form words by blending onsets and rimes, and (e) finish a sentence completion activity.

Words were selected from different word families each week for the sight word intervention. In addition to weekly 45-minute sessions, parents were provided instructions on how to work through the lessons three to six times a week with their children. While results from the study indicate a steady progression of the number of training words read by all but one child on a weekly basis, perhaps the most the important finding lies in the issue of generalization. While none of the children receiving whole word intervention demonstrated an ability to identify words that were not taught, a contrast was found in the children that received analytic reading instruction. A steady improvement was found in their ability to accurately read the generalization words. While there was one exception on both of these measures, this child still made progress from pre-intervention to post-intervention measures.

A change in the line of research of word instruction for children with DS seems to be emerging. Some studies examined the teaching of sight words using behavioral techniques such as fading and prompting. More recently, others have explored phonics instruction as a means to help students decode and spell words in print that they have never seen before. While there are few such studies, this research suggests the importance of further study of decoding and spelling strategies for children with DS.

Phonological Awareness in Children with DS

Since the late 1990s, phonological awareness (PA) has been a heavily researched area of literacy and DS. Children with speech and language impairments, and particularly children with DS, are more likely than children who are typically developing to have weaker phonological processing skills that can result in literacy learning difficulties (Leitao, Hogben, & Fletcher, 1997). One of the most controversial studies was conducted by Cossu, Rossini, and Marshall (1993) who concluded that children with DS do not develop PA. Cossu et al.

(1993) selected ten Italian-speaking children with DS who could read aloud. The average chronological age of the children was 11 years while the average cognitive age was reported as five years. These children were matched in reading ability with a group of children who were typically developing whose average chronological age was seven years old and cognitive age eight years old. Tests measuring phoneme segmentation, phoneme deletion, oral spelling, and phoneme synthesis were administered to both groups. Results indicated that typically developing children outperformed children with DS on all of the tasks. Despite recognizing that children who are typically developing often struggle with many PA tasks, Cossu et al. concluded that the children with DS had somehow learned to read, despite the deficits in this area, and thus, bypassed the developmental stage of PA found in children who are typically developing. Further conclusions suggested the importance of the teaching of reading by skills directly associated with reading, such as letter-sound correspondences, and not PA skills in isolation.

Evans (1994) supported Cossu, Rossini, and Marshall's (1993) findings in a separate study that was part of a larger study on literacy development. The six children with DS completed PA tasks that were similar to the previous study, including the ability to read and spell nonwords and words. The researchers found that students were unable to complete tasks, regardless of difficulty level. Issues surrounding the scoring of tests and results included participants' refusal to attempt the tasks, inability to score on the tasks due to severe articulation issues, and general lack of understanding of some of the tasks (Evans, 1994). Given the small sample size and only one chance at demonstrating understanding, it seems unwarranted to conclude that the students lack conventional PA skills. The types of tasks that were required of students may also need analysis.

Cossu, Rossini, and Marshall's (1993) findings are frequently discounted by other researchers due to various flaws in the study, including the fact that (a) none of the children with DS scored a zero on the various PA measures, which indicated some level of PA (Byrne, 1993), (b) children who are typically developing would not be successful with the administered PA tasks (Morton & Frith, 1993), and (c) some of the PA tasks were more complex than other strategies often used (Byrne, 1993; Gombert, 2002). Specifically, the use of nonwords in a word attack task may require different neuropsychological skills than the use of real words in a word attack task (Fidler, Most, & Guiberson, 2005).

Contrary to Cossu et al. (1993), at least three studies (Cupples & Iacono, 2000; Fidler et al., 2005; Roch & Jarrold, 2008) have supported the relationship between phonological awareness and reading ability in DS as being commensurate with that of children who are typically developing. Studies have supported the presence of PA in individuals with DS (Fletcher & Buckley, 2002; Gombert, 2002; Kennedy & Flynn, 2003b; Snowling, Hulme, & Mercer, 2002; Verucci, Menghini, & Vicari, 2006). Other studies have demonstrated that individuals with intellectual disabilities (Conners, Rosenquist, Sligh, Atwell, & Kiser, 2006; O'Connor, Notari-Syverson, & Vadasy, 1996), and specifically, individuals with DS can be taught PA (Gombert, 2002; van Bysterveldt, Gillon, & Moran, 2006). Other studies have called into question Cossu et al.'s findings and conclusions based on individual variation in PA development. That is, some researchers have found that phonemic awareness seems to develop first and rime awareness later (Kennedy & Flynn, 2003a; Snowling et al., 2002; Verucci et al., 2006). Although several studies seem to document an advantage for the use of visual reading strategies in individuals with DS, none of these took into account the participants' educational history, which may have revealed an earlier visual method of

instruction, thus prejudicing the results (Fidler et al., 2005; Roch & Jarrold, 2008). Indeed, the background of the child prior to school may likely influence the PA development (Stuart & Coltheart, 1988). Further insight into PA skills could be gained through longitudinal studies, which might eliminate some of the participants' apparent lack of understanding of the PA tasks. In addition, studies that measure the areas of reading that are influenced by PA skills might provide further insight. While children with DS demonstrate relative strengths in visual-orthographic processes and weaknesses in phonological processes, this does not imply that instruction with an emphasis on whole word processes is most appropriate (Abbeduto, Warren, & Conners, 2007).

Research in the area of literacy and intellectual disabilities is limited and has "slowed to a trickle" in the past fifteen years (Conners, 2003, p. 223). Yet the academic community continues to hold the responsibility of pushing the field of special education toward investigations that take into account the broader research base that undergirds the field of literacy. The studies above have continued to show the literacy capabilities of children with DS. If literacy acquisition is fundamentally the same for all, then opportunities for learning to read and write should be non-negotiable (Farrell & Elkins, 1994/1995). This perspective is further supported by the work of Perfetti (1985), which implies that all readers demonstrate the same cognitive processes when learning to read.

Understandings from the Field of Reading

In the words of Charles Perfetti (1985), "Reading is both simple and complex. It is, at the same time, both cognitively trivial and so difficult that failure at learning to read is common" (p. 3). The mature reader often has difficulty recalling how the ability to read occurred. It's simple in the respect that once it is acquired, one is able to access the

necessary skills without effort. Yet the complexity of reaching this point of reading requires the synchronism of multiple processes. Perfetti (1985) and others have studied the mature reading processes in order to better understand early reading acquisition (Adams, 1990; Raynor & Pollatsek, 1989). Once the processes of the mature reader have been examined, a closer look at early reading development will provide further insight into the process of becoming a reader.

The Mature Reader

Cognitive psychologists such as Perfetti (1985), Adams (1990), and Raynor and Pollatsek (1989) have concluded that certain knowledge is necessary to become a mature reader. One must understand that letters are represented by certain shapes. Each letter represents a certain sound or sounds. The reader must be able to take individual phonemes, as well as combinations of phonemes, and relate these to the orthographic information in written words. This connection of phonological and orthographic knowledge is referred to as phonics. The reader is then able to use this phonics information to form an understanding of words. The understanding of a word requires elements of spelling, pronunciation, syntax, and meaning. All of the above components interact with the individual's world knowledge to form comprehension.

Adams (1990) has discussed the interactive nature of the knowledge required to become a word reader. The successful reading of words hinges on the processing of the information. The orthographic, phonological, and meaning processors all interact and receive information concurrently, thus allowing each processor a role in negotiating the information. Like Perfetti's (1985) model, the speed and accuracy of information exchange is integral to the formation of understanding of a word. When one of the connections

between the processors falters, information will be lost, and may result in difficulty with word identification. The above three processors are limited by the influence of context yet are driven by the efficient processing of orthographic and phonological information.

In order to read a word, a dual route to retrieval of lexical information exists (Perfetti, 1985). This dual route, consisting of visual and phonological information, operates in a redundant fashion. In other words, even a word that is identified automatically, or by sight, still passes through this dual route, where visual information and phonological information is processed. According to Perfetti (1992), learning to read, and more specifically, to identify words, is reliant on the development of an autonomous lexicon. An autonomous lexicon contains pronunciation, spelling, semantic, and syntactic information of a word. Entries in the autonomous lexicon are fully intact and redundant, developing via the matching of orthographic and phonemic strings of words as well as practice, and are not influenced by outside knowledge.

Perfetti (1985) argues that in order to have the optimal amount of resources available for comprehension of a text, one must master the code to the extent that it requires a lower level of cognitive demand. As readers advance, cognitive resources must be allocated in the most efficient ways possible to insure understanding of more challenging text. As a result, cognitive resources that are continually taxed by the coding process will result in difficulties with comprehension. These ideas are the premise behind Perfetti's (1985) verbal efficiency theory. Skilled reading, consisting of average comprehension and reading rates, is reliant on verbal efficiency.

The Beginning Reader

In order to form this lexical knowledge and lexical access that represents the core of reading, a number of skills must be developed. As a child is acquiring phonemic awareness and orthographic awareness, a basis of word knowledge is being formed. This knowledge influences a child's word recognition and spelling (Henderson, 1990; Morris, 2005; Perfetti, 1992; Share, 1995). Ball and Blachman (1991) define phonemic awareness as an understanding that spoken words consist of sequences of individual sounds (Ball & Blachman, 1991), while Blachman (1997) classifies phonological awareness as an understanding that speech consists of phonological segments that can, for the most part, be represented in an alphabetic orthography. Perfetti (1986) argued that phonemic awareness is an absolutely essential component to the understanding and use of the alphabetic principle (i.e., understanding that letters represent speech sounds). This rationale is supported by the current understandings of phonemic awareness and early reading.

A number of researchers have described stages of early reading development. Ball and Blachman (1991) argued that certain phonemic awareness skills are pre-requisites that have to be in place before a child can move forward in reading development (Ball & Blachman, 1991). In contrast, Stuart and Coltheart (1988) described the development of the orthographic and phonological processes in relationship to early reading development as reciprocal in nature. Each child brings a unique skill set to school and may be at different stages of development. After measuring the phonological knowledge of 23 children prior to learning to read and then following up as the children began to learn to read, Stuart and Coltheart (1988) found that some children had developed some phonological understandings as they learned to read while other children with fewer skills in phonological knowledge may have begun to read using a visual strategy. Children with phonological knowledge are

believed to use print to sound as well as sound to print information, thus establishing a relationship between the phonological and orthographic processes that is better characterized as reciprocal with early reading acquisition (Stuart & Coltheart, 1988).

Stuart and Coltheart's (1988) position has been supported by research into stages of word reading and spelling development (Ehri, 1989, 1998; Henderson, 1990). While they use slightly different categorical names, both Ehri (1989, 1998) and Henderson (1990), along with Morris (2005), and Schlagal (1989, 2007) all describe stages of development that are sensitive to the variation that can occur in phonemic and orthographic understandings. The relationship between the two is that of a complementary or reciprocal, where gains in either area will support development in the other (Morris et al., 2003; Perfetti, 1986).

According to Henderson (1992), the heart of literacy is word knowledge, the alphabetic principle, and orthographic features of pattern and meaning that emerge from it. Orthographic awareness is the knowledge of letter sequences or spelling patterns that occur frequently in the written language (Morris, 2005). Ehri (1998) acknowledged the similarity of processes involved in reading and spelling words due to the dual connection of the alphabetic system but found spelling to be more complex because more information is required to spell a word correctly. Knowledge of the letters, the spelling system, and lexical knowledge must be combined and synthesized to formulate a response (Ehri, 1989).

Phonological processes, including phonemic awareness, support word recognition. These are not innate processes but instead must be learned by the individual. Morris et al. (2003) examined the complexities in the beginning processes and proposed a model of early reading development consisting of seven parts: alphabet knowledge, beginning consonant awareness, concept of word in text, spelling with beginning and ending consonants, phoneme

segmentation, word recognition, and contextual reading. Each of the components of the interactive model build on one another and are detailed below.

Morris, et al. (2003) argue that alphabet knowledge begins with an understanding that certain shapes and lines form certain letters that are known by specific names. This represents an entry point into reading. Children bring various levels of alphabet knowledge with them to school and this knowledge influences the development of beginning consonant awareness. Simply put, children must know what letters are before they see them in words. As children begin to learn the alphabet, they begin to recognize that most of the alphabet letters carry a specific sound. From this point, two skills seem to develop concurrently: (a) concept of word and (b) spelling with beginning and ending consonants. Concept of word is an understanding that groups of letters bound by spaces represent words. Children demonstrate an understanding of concept of word by accurately matching spoken to written words in a memory-supported text. As this skill is developed, children often demonstrate an understanding of beginning and ending sounds in their spellings. With these skills in place, phoneme segmentation is often observed in children by the end of kindergarten. Children are able to focus attention on more than the beginning and ending sounds of a word. They are able to represent the vowel sound, thus leading to word recognition. All of the above processes are interacting as first graders progress toward contextual reading. By the end of first grade, a typical child has all the tools necessary to become a skilled contextual reader.

This model was examined in two separate studies that monitored the progression of typical kindergarteners and first graders. Morris (1993) first proposed the model in a small-scale study of 52 kindergarten children and the results were then replicated in a study that assessed the growth of 102 children from kindergarten through first grade on these measures

(Morris et al., 2003). The results provided empirical evidence that development of concept of word played a key role in the transition from beginning consonant awareness to later development of phoneme segmentation. The areas of spelling and word recognition have received much attention in reading research. The proposed developmental stages of each are explored below.

Ehri (1998) has described the development of word knowledge in four phases: pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic. In the pre-alphabetic phase, children begin to read words by relying on associations they make with the environmental print. Unlike the later phases, children are not using letter-sound connections during the pre-alphabetic phase, but instead are relying on visual cues for the pronunciation of the word. For example, a child may remember the word, *look*, by associating the doubled letters with eyes, thus relating the physical features of the letters to its meaning. When children begin to make letter-sound connections, they begin to recognize some of the letters and the sounds they represent in a word. To remember a word, children typically use the beginning and final letters which represent the most salient sounds. In other words, a child may remember the word, *bat*, by recognizing the *b* and *t* in the word but pay no attention to the medial sound. As connections between the letters and phonemes fully develop, children transition to a reliance on these connections for the pronunciation of the word. Children in the full alphabetic phase no longer confuse similarly spelled words due to use of each letter and its sound for pronunciation. For example, *bat* is no longer confused with *bit* or *but* since the child is now using each sound in the word. During the consolidated alphabetic phase, children become more familiar with commonly occurring spelling patterns. Instead of remembering words letter by letter, children begin to store multi-letter units as syllables,

morphemes, and onsets and rimes in memory. So, *bat* is no longer stored individually but instead is stored as an *–at* word with multiple onsets making multiple words.

The work of Henderson (1990) has extended the stages in order to account for continual phases of spelling development. As children gain a strong understanding of patterns, they begin to experiment with combining words through use of endings. In the syllable juncture phase, children must learn the rules surrounding: (a) the doubling of letters in multi-syllable words when adding inflections (e.g., hoping and hopping), (b) consonant assimilation or combining two parts of a word and determining when letters should be doubled (e.g., con + rec = *correc; correc* is used to form the word *correction*), and (c) further development of polysyllabic words by recognizing a root word within a polysyllabic word that will help identify the meaning (e.g., *vis* in the word *envision*).

Understanding the complexities of the English orthography begins to take shape at a young age in children, yet continues to develop throughout adulthood as knowledge of other languages influences understandings of spellings and meanings of words. In sum, words may initially be recognized by memory based on visual cues. However, this process evolves once a child has some alphabetic knowledge. Connections are made between pronunciations, letters, and sounds of written words. These connections become more sophisticated as alphabet knowledge is gained and grapheme and phoneme information are clarified. As readers continue to increase their understandings, an efficient organization system is negotiated so that words are consolidated based on letter sequences and patterns. This consolidation accounts for the ability to store and then accurately retrieve the correct pronunciations and meanings of words automatically.

As the beginning reader is learning about the components of word representation, a functional lexicon (i.e., a person's knowledge of word meanings and their uses) is being formulated (Perfetti, 1992). This functional lexicon is influenced by not only the quality of the word representation, but also the quantity of the representations encountered. This functional lexicon influences the beginning reader's ability to decode.

One key feature of the self-teaching mechanism, or ability to use decoding skills and abilities to independently learn new words, is the developmental nature of decoding itself. Share (1995) describes the development as an item-based, rather than stage-based, process. To explain further, some words are committed to a child's memory after only a few repetitions as a result of the frequency of exposure, knowledge in the lexicon, and complexity of the orthography. When encountered again, little decoding is required since the orthographic information from the word has already been stored and the word has moved to sight word status. However, other lower frequency words will require a greater reliance on the phonology until they are transferred to automaticity. For this reason, beginning readers do not move through prescribed stages of word reading that imply a maturation period. Instead, the progression is dependent on the words themselves.

Another feature of the self-teaching mechanism of decoding is what Perfetti (1992) referred to as progressive lexicalization, or the evolving of the lexical process so that words are stored as meaningful units rather than as separate entries in the lexicon. Its operation is dependent on the letter-sound knowledge, beginning phoneme awareness, and ability to use context for determining word pronunciations. As a child gains a basic knowledge of the alphabet and the corresponding sounds, combinations of letters are affiliated with certain sounds in pronunciation. As the child advances, words move from being identified by the

letter-sound correspondences to a state of identification that relies on the characteristics of the unit, such as spelling patterns and morphemes. As lexicalization becomes more sophisticated and efficient, autonomous entries are created in the lexicon.

Word Instruction

According to the National Reading Panel (National Institute of Child Health & Human Development, 2000), for children to develop the decoding skills necessary for reading words, an explicit and systematic phonics instructional method should be selected. There are a variety of effective phonics instructional approaches, and research does not support one as superior to the other (Stahl, Duffy-Hester, & Stahl, 1998). Instead, the method of phonics instruction varies with some being based in word-parts, and specifically, in rimes.

One component in learning how to read is the ability to read words. According to Baron (1979), children use both orthographic and word-specific mechanisms while learning words. These mechanisms are used in four different ways: use of analogies, searching memory for known words with those parts, inferring the pronunciation, and using spelling-sound correspondences for larger word-parts. Two of these mechanisms are used specifically in this study: use of analogies and using spelling-sound correspondences for larger word-parts.

Baron's (1979) first method has been referred to in the literature as (a) using words that you know (Cunningham, 2009), (b) the compare-contrast strategy (Cunningham, 1975/6), and (c) decoding through use of analogy (Marsh, Desberg, & Cooper, 1977). When children have some sight word knowledge and are able to intrinsically compare how words are alike or different in order to determine the pronunciation of the word, they are decoding

by analogy (Cunningham, 1975/6; Marsh et al., 1977). Likewise, using words you know requires some level of sight word knowledge for the child to be successful with the strategy.

Baron's (1979) second method has been referred to as (a) decoding by pattern (Cunningham, 2007), (b) sensitivity to spelling patterns (Cunningham & Allington, 2007), and (c) reading words by orthographic structure (Ehri, 1991). Regardless of how it is described, this method focuses on the spelling patterns in the words. As children gain an understanding of letters and sounds, an emphasis in instruction is placed on drawing attention to patterns within words in order to further decoding and encoding skills. One such teaching strategy is *Making Words* (Cunningham & Hall, 1994). The use of spelling-sound correspondences for larger word-parts may not require the same level of prerequisite skills as Baron's (1979) first method. Cunningham and Creamer (2009) argue that since no study has been able to use a task that parses decoding by pattern separately from decoding by analogy, there is no direct evidence that decoding by pattern requires a separate, developed sight word knowledge, as decoding by analogy does.

Conclusions

At the earliest stages of reading, orthographic understandings are being formed as the self-teaching mechanism is affected by letter-sound knowledge, phonemic awareness, and use of contextual information. Within these, letter-sound knowledge and phonemic awareness often develop simultaneously during reading. The orthographic knowledge will continue to develop and reach a greater level of sophistication with continual successful decoding opportunities that Share (1995) has linked with letter-sound knowledge and phonemic awareness in the self-teaching hypothesis. Perfetti's (1985) examination of the mature reader and how reading occurs would imply that all individuals go through the same

cognitive processes when reading. If this is the case, then central to understanding word reading is an understanding of the proposed model of early reading development by Morris, Bloodgood, Lomax, and Perney (2003). These foundational understandings lend support to a spelling-based phonics approach.

Historically, word instruction for individuals with DS has primarily consisted of behaviorally-based sight word instructional strategies. Although the individuals seem to learn how to identify these targeted words, their ability to read words in context has been limited to the familiar sight words they have been taught. With the research base for literacy studies of children with intellectual disabilities being small (Joseph & Seery, 2004), accounts of phonics instruction are primarily anecdotal and descriptive, including Hunt (1967) and a few case studies (Cupples & Iacono, 2002; Groen, Laws, Nation, & Bishop, 2006). However, the field of literacy contains a knowledge base that is rich in depth and breadth of phonics research. By applying understandings from studies of children who are typically developing, not only will the research base for children with disabilities broaden, but children with DS can be taught more effectively and efficiently in order to read more widely and independently.

CHAPTER 3

METHODS

Purpose of the Study

This study was designed to investigate the effects of providing a spelling-based phonics intervention (Stahl, Duffy-Hester, & Stahl, 1998) to children with Down syndrome (DS). Because many children with DS are believed to have severe difficulty learning phonics (Buckley, 1985, 1995), children typically have been taught from curricula and materials emphasizing sight words (Buckley, 1985, 1995; Edmark Reading Program, 1972; Oelwein, 1995), which is insufficient for wide independent reading (van Bysterveldt, Gillon, & Moran, 2006) since it means children taught in such a manner can only read texts consisting of words they have specifically been taught. This study investigated whether children can learn to apply spelling-based strategies while engaging in guided invented spelling (Cunningham & Cunningham, 1992). Within-lesson progress, effects and generalizations of specific patterns taught, long term retention of patterns taught, and long term application of the strategy of spelling by pattern (Cunningham & Creamer, 2009) were measured.

Research Statement and Questions

This study employed a case study design (Yin, 1994) to determine the effects of a spelling-based phonics instructional strategy on decoding abilities of children with DS. The strategy, *Making Words* (Cunningham & Hall, 1994), consists of three distinct steps: word-

making, word sorting, and transfer. From this point on in the manuscript, any reference to *Making Words* refers to the strategy developed by Cunningham and Hall.

The following questions were explored:

1. What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to read words with high frequency rime patterns taught in the instruction?
2. To what extent does this ability transfer to reading untaught words with high frequency rime patterns?
3. What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to spell words with high frequency rime patterns within and beyond the lessons?
4. To what extent does this ability transfer to spelling untaught words with high frequency rime patterns?
5. What are the effects of a spelling-based phonics instruction strategy on the ability to indicate growth and development of phonemic awareness and orthographic knowledge?
6. What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to segment words?
7. What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to use a limited set of letters to engage in word-making?
8. What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to identify rime patterns within a limited set of words?

Study Setting

This study was conducted in a separate, public school for students with exceptionalities in a rural region in western North Carolina. The school served 88 K-12 students, ages 5-21 years, with severe behavioral difficulties, autism, and multiple physical and intellectual disabilities. Students did not receive opportunities to participate with same age peers who are typically developing during the school day. Each participant worked one-on-one in a testing or therapy room at the school for the duration of the study. The teachers and researcher developed a consistent pull-out schedule for the participants that would not interfere with their other academic classes. Exceptions to this schedule occurred only on special days such as field trips or Special Olympics.

Student Participant Selection

Screening Procedures for Potential Participants

Once the study was approved by the Institutional Review Board, superintendent of the school system, and principal of the school, I met with the teachers at the school. After agreeing to participate in the study, the teachers provided me with a list of potential participants for the study. Once parental permissions were in place, each of the 13 potential study participants were screened in order to determine early literacy profiles. Screening procedures assessed alphabet knowledge and letter-sound knowledge.

Alphabet knowledge. In order to assess alphabet knowledge, the letter-name subtest of the Phonological Awareness Literacy Screening for Kindergarten (PALS-K; Invernizzi, Meier, Swank, & Juel, 2003a, 2003b) was administered to all potential participants. Invernizzi et al. (2003a, 2003b) established a spring benchmark for kindergarteners of 24 of 26 letters identified by name. PALS-K is used throughout the state of Virginia and

represented a highly reliable instrument. Cunningham and Hall's (2009) informal assessments in *Making Words First Grade* assess letter-name knowledge for all letters except *q*, *v*, *x*, and *z*. The criterion of 21 of 22 letters identified by name correctly, with the exception of the four letters indicated, was established in an effort to ensure that the study participant had the necessary pre-requisite skills.

Letter-sound knowledge. The letter-sound knowledge of each potential participant was assessed using the beginning consonant awareness subtests of PALS-K which are described below (Invernizzi, Meir, Swank, & Juel, 2003a, 2003b). Flanigan (2007) used these two subtests of PALS-K in his study of kindergarten children to determine beginning consonant awareness levels and assigned a mastery criterion of 90% on the total of the two subtests. Picture supported assessments have a history of successfully reducing memory load in research with children with DS (e.g., Goetz, Hulme, Brigstocke, Carroll, Nasir, and Snowling, 2008). The first subtest required the student to pick the picture that represented the same beginning sound as the given picture while the second subtest required the student to sort the picture cards by beginning sounds. Both subtests have practice items and students were provided with the names of each picture in order to eliminate any confusion in identifying the picture itself. The same criterion used by Flanigan (2007) was used for participants in this study since the planned intervention required a solid understanding of letter-sounds.

Re-Examination of Screening Procedures

After completion of the screening procedures, two potential participants, numbered 2 and 3, met the criteria. After continuing with the study pretest measures, including word recognition, rime, and spelling tasks, these two potential participants were found to have

phonics skills that exceeded the goals of the study and were therefore excluded from participation. Additionally, potential participant numbered 10 was excluded due to unintelligibility of speech, potential participant numbered 11 due to frequent use of sign language along with oral speech, and potential participants 4 and 5 due to an inability to provide a consistent verbal or pointing response.

Considering that the above criteria were established based on a spring benchmark of typically developing kindergarten children, the remaining screening results of potential participants were reexamined in order to determine those who might benefit from the instruction.

Potential participants numbered 1, 9, 12, and 13 in Table 1 were selected for the study due to their ability to demonstrate: measurable literacy skills that were indicative of learning potential, speech-language intelligibility that I understood, few or no obvious behavior problems during the screening, and engagement during the screening. Three of the four participants could identify most of the letters in the alphabet screening and all four demonstrated some understanding of letter-sounds. In addition, these four potential participants were given practice lessons that were similar to the *Making Words* lessons, and they were able to demonstrate a basic level of understanding of the language used during the instruction. The table below provides a summary of screening results.

Table 1

Screening Results

Potential Participant	Alphabet Knowledge[a]	Letter-Sound Knowledge[b]
1* Mark	19	10
2	21	20
3	21	20
4	no response	no response
5	2	2
6	10	6
7	0	8
8	4	4
9* Jack	3	6
10	3	8
11	22	12
12* Tina	16	8
13* Kate	22	9

[a] Initial criteria of 21 of 22 letters established.

[b] Initial criteria of 18 of 20 beginning letter-sounds established.

*Selected for the study. All names represent pseudonyms.

Description of Participants

Instructor

I administered all assessments and instruction. As a former special educator with ten years of teaching experience in North Carolina public schools, I hold degrees and licensure in both special education and reading education.

Participants

Participants who attended the public schools and received exceptional children services in a rural school district in western North Carolina were recruited through the special education director in the county. Each participant was between the ages of 16-19 years and was diagnosed with DS and moderate to severe levels of intellectual disability. Participants had hearing and vision either corrected to or within normal limits, used oral speech in English as their primary mode of communication, and had a level of speech intelligibility that was understood by most people (Cupples & Iacono, 2002).

Information gathered from record reviews, teacher interviews, and observations during literacy instruction was combined to form the participant descriptions below. The four study participants were labeled as trainable mentally disabled under the state's guidelines at that time and all four attended a separate, K-12 school that served children with special needs. Pseudonyms were used to protect the identity of the participants. Pseudonyms are used identify participant 13 as Kate, 1 as Mark, 12 as Tina, and 9 as Jack.

Kate. Kate was a 16-year-old female who had been labeled as "trainable mentally disabled." She underwent heart surgery at 4 months of age and had back surgery one year prior to the study. She began receiving services as a child with a special need at the age of three years old. At ten years old, the Differential Ability Scales (DAS; Elliott, 1990) suggested a general cognitive ability score of 26. Overall delays in educational areas, adaptive behavior, and articulation were indicated. At the age of fourteen years old, the participant was tested using the Wechsler Intelligence Scale for Children, 4th Edition (Wechsler, 2003) and a full scale intelligence quotient (IQ) of 40, in the moderately mentally

disabled range, was found. The author of this particular report questioned her ability to learn to read and write.

Despite the statement of inability in the psychoeducational report, Kate was receiving literacy instruction, in addition to social studies and health, with one teacher during the course of the study. All other subjects, including mathematics and independent living, were taught by her homeroom teacher. Since her reading group had concluded for the school year, I was unable to observe her during this instructional time. The reading group teacher was interviewed concerning Kate's literacy instruction. She indicated that the Edmark (1972) sight word program was the primary mode of literacy instruction. Reading comprehension work through use of short story books occurred on occasion. The students took turns reading a story aloud and then answering questions posed by the teacher.

At the time of the study, Kate wore glasses, and received occupational therapy and speech-language therapy twice a week. I understood her conversational speech. Her most recent individual education plan (IEP) stated that she could read many sight words and three- to four-line stories from a sight word reading program. Her literacy-related objectives included increasing the number of sight words she could read, summarizing the topics of texts read to her or simple texts that she read, and developing solutions to different problems presented in text.

Mark. Mark was a 17-year-old male. He was initially placed as a student with a special need when he was six years old. At this time, his IQ was measured using the Stanford-Binet Intelligence Scale, 4th Edition (Thorndike, Hagen, & Sattler, 1986), resulting in a composite score of 48. When he was 10 years old, the DAS was administered and

resulted in a general cognitive ability score of 25. Commensurate abilities were found in educational and adaptive behavior tests, and an articulation disorder was identified.

At the time of the study, the participant received speech-language therapy twice a week, but I understood his pronunciations of words. His most recent IEP indicated that he could read approximately 30 sight words, as well as simple stories containing these words. He could answer some questions about a passage that was read to him as well as recognize and read community and survival signs. His current IEP indicated the following literacy-related objectives: spelling words using phonics skills, increasing sight word knowledge, reading sight word stories with minimal assistance, typing his personal information in a word processing document, comprehending a variety of reading materials, and writing with complete sentences.

During an observation of literacy instruction, Mark and Jack worked in a group with one additional classmate as the teacher completed an Edmark (1972) reading lesson on the word, *green*. Each student took turns responding to the teacher. Similar lessons lasted for a period of approximately 30 minutes and occurred typically twice a week. The teacher indicated that she sometimes incorporated easy reader books containing three and four word sentences into the lessons, if she was able to locate one that had the specific word that was featured in the lesson. On the other three days, the focus of the block of time changed. For example, the teacher might work on word identification with Mark and Jack twice a week, and work with the entire class twice a week by focusing on a specific theme or topic, such as geography or current events. Thus, she incorporated social studies as well as science during this time. Daily writing activities consistently involved copying personal information.

Tina. Tina was a 19-year-old female. She was initially placed in special education at the age of three years. At nine years of age, her full scale IQ score was 40 on the Wechsler Intelligence Scale for Children, 3rd Edition (Wechsler, 1991). Additional testing in education, speech-language, adaptive behavior, and visual motor functioning were considered significantly below average. Speech-language services had been terminated approximately three years prior to the study. I easily understood her speech.

Her IEP, as well as information from the teacher interview, indicated that she could recognize some basic sight words, enjoyed learning words, and liked to copy vocabulary words. According to the teacher, her classroom literacy instruction was functional in approach. She indicated that Tina liked copying words and viewing a set of index cards with words written on them. The teacher felt that Tina liked reading and writing tasks.

Her literacy-related objective related to the learning of new sight words. Consequently, her teacher indicated that her literacy lessons were structured primarily by the Edmark Reading Program Software (1986). Other literacy activities that occurred in the classroom included reading and discussing stories of interest as well as phonics exercises that emphasized sounding out each letter of targeted words. Tina was required to complete a functional assignment in the mornings which included copying the date, her work schedule, and personal information.

I observed Tina during her literacy instruction in the afternoon. During the 30-minute timeframe, Tina independently completed a set of worksheets that involved skill practice with money, letters, and letter-sounds. In addition, coloring sheets were included (see Appendix G for work samples). Half of her school day was committed to vocational training off-campus.

Jack. Jack was an 18-year-old male who was initially placed as a student with an exceptional need at the age of six years old. He was diagnosed as a child with DS in his country of birth, Canada, which differs from his parents' homeland, Laos. The native language was sometimes spoken in the home. He underwent heart surgery when he was 12 months old.

His initial placement report indicated that he scored below the 2-0 age equivalent on the Woodcock Johnson Tests of Cognitive Ability (Woodcock & Mather, 1989), and educational, adaptive behavior, motor, and speech-language testing indicated similar age equivalents. A hearing screening was passed.

At the time of the study, the participant wore glasses and received speech-language therapy twice a week. He maintained conversational speech that I easily understood. His most recent IEP indicated that he knew several sight words, had neat handwriting, and could assist in creating a sentence using pictures. The following literacy-related objectives were noted: increasing his sight word knowledge, verbally creating a sentence using a new vocabulary word, and writing a word without a model.

Like Mark, Jack received literacy instruction approximately twice a week in a small group consisting of three students and the teacher. The students took turns answering questions and responding to the teacher in Edmark (1972) reading lessons. Jack's daily writing instruction consisted of copying his sight words and personal information.

Procedures Prior to Instruction

Background Information

Background information was obtained from special education records on each participant. The IEPs were reviewed in order to determine literacy-related goals and

objectives. Information collected included age, medical diagnosis, psychoeducational evaluation information (e.g., intelligence and academic measures), current special education placement setting, and current IEP goals that were related to literacy.

Observation and Interview

Each special education teacher was interviewed regarding the participants' instructional programs. Participants also were observed during word instruction in their regular school programs in order to gain information on the types of literacy materials, activities, and strategies they were receiving. The interview and observation provided the opportunity to ask questions about any particular behavioral or other issues impacting learning as well as insure that *Making Words* or instruction similar to *Making Words* was not occurring already during the school day. Since the study took place during the school day, anecdotal records were kept on the type of literacy instruction that participants were engaged in during the school day. This information assisted in interpreting results and the effectiveness of the instruction. Teachers were asked to respond to the following questions:

1. Can you describe your literacy instruction?
2. What does it look like on a daily basis?
3. Do you use any reading programs in your classroom?
4. With (name of student)?
5. How long have you been teaching (name of student)?
6. Which programs?
7. How do you use them?
8. How often?
9. How do they address the student's IEP goals or broader literacy needs?

Practice Lessons

A minimum of three lessons similar to *Making Words* was provided prior to the instruction to familiarize participants with the lesson format and expectations. This allowed participants to become familiar with the strategy. In addition, a number of key terms needed to be understood by the participants, such as *letter*, *change*, *add*, *take away*, and *rhyme*, as well as the understanding of number quantities up to three. For example, I said, "Add one letter to *at* to spell the three letter word, *hat*." Participant performance during the practice lessons allowed me to make inferences about the level of prompting that was needed during the instruction. None of the potential participants was able to complete a practice lesson without error which suggested little or no prior experience with the strategy as well as the need for the intervention.

Study Design

Emerging from the field of empirical social research, case studies are used widely in research as a method for answering focused questions in a rather short period of time and may examine a wide range of events, people, programs, issues, or topics (Hays, 2004). In relationship to studies of people, case studies may examine a range of individuals, a small group, or a selected individual.

A number of case study designs exist and include descriptive, explanatory, and exploratory designs. The exploratory design is often employed in order to explore the feasibility of procedures or to define research questions for a subsequent study (Hancock & Algozzine, 2006). This exploratory research design was used to better understand the methods for teaching and assessing the effects of the spelling-based phonics approach with children with DS.

Case studies may incorporate quantitative or qualitative or a mix of both approaches. Commonly found in special education, quantitative case studies often contain a battery of measurements and a collection of descriptive variables (Stake, 1995). Each case is examined in order to reveal new and unique interpretations, explanations, and cause-and-effect links (Hays, 2004).

Well-researched questions are imperative in order to maintain the focus of the case study. Rather than merely informing the researcher on what is known about the topic, Yin (1994) suggested that the literature review should serve as a means for developing more insightful and refined questions on the topic. A study's questions, propositions, and units of analysis should inform the researcher of what data should be collected but also what is to be done after data collection, based on the connection of the data to the propositions and criteria for interpretation (Yin, pp. 26-7).

Considered a strength in case study research, the use of multiple data sources is often referred to as triangulation (Yin, 2009). The use of multiple sources of data collected through multiple methods for each research question results in a more comprehensive examination (Hays, 2004). While a battery of tests is one source, other sources may include observations, interviews, documents, and records.

In this study, several methods were implemented. Teacher interviews, record reviews, and observations provided information on case history and historical instructional methods. Pretest and posttest measures were collected prior to and after the instruction. During the instruction, daily measures and intermittent measures of progress were recorded.

Pretest and Posttest Procedures for Participants

Decoding Measures

Word recognition task. In order to determine the potential participants' ability to decode, or mediate a word, the *Qualitative Reading Inventory-3* (QRI-3; Leslie & Caldwell, 2001) was administered. To determine the leveled lists of this word recognition assessment, Leslie & Caldwell (2001) sampled the passages and established word frequency based on the *Standard Frequency Index* (Carroll, Davies, & Richman, 1971). Leslie and Caldwell (2001) have suggested independent word recognition levels, or levels in which the student can independently read the words, as 90% or above. The study participant was asked to read aloud a word in flash presentation from a slide show format on a computer. I then recorded the response on paper in order to determine percentage level of performance. The mediated score served as an additional measure of decoding ability. If the participant was able to decode any words missed in flash presentation, this would indicate more advanced phonics skills than the scope of this study. Any potential participant who could read a second grade word list in flash presentation with 90% or more accuracy was eliminated since the focus of the study addressed a decoding intervention.

Rime Task. To measure the ability of the potential participants to combine a high-utility orthographic rime with an onset to read an unfamiliar word, the Z Test (Cunningham et al., 1999) was administered. The Z test consists of 37 words, 32 nonsense and 5 real words beginning with the letter Z, that contain high frequency rimes found on the Wylie and Durrell (1970) list. For the Z Test, participants were told that they were playing a game in which they had to break the code on the planet Z and that all words had the letter, Z, at the beginning. This test provided a pre- and post- measure of rime understanding in the current

study. The goal was to see if the participant could combine the rime with an onset to read an unfamiliar word. Credit was given if the participant could blend the *Z*, or another sound, with the rime. For example, a participant that read *at* for *zat* did not receive credit while a participant that read *hill* or *zill* did receive credit for *zill*.

Spelling Task

To measure phonemic awareness and orthographic knowledge, a developmentally-based spelling inventory, the Qualitative Inventory of Word Knowledge-Short Form (QIWK; Schlagal, 2007), a modification of the original (Schlagal, 1989) was administered. This inventory was designed to measure sensitivity in growth in word knowledge from a developmental perspective. The student's spelling of each word was analyzed in order to gain an understanding of ability to apply beginning and ending consonant knowledge and vowel representations. As the student advances through the list, more complex spelling concepts are assessed, such as application of the doubling principle that occurs in the syllable juncture phase. Any potential participant who spelled most of the words correctly on the second grade list would have been eliminated from this study.

Segmentation Task

To measure the ability of the study participants to segment words, Cupples and Iacono's (2000, 2002) 12-item segmentation task was used as pre- and post-instruction assessment task. The participants were presented with four blocks and a line drawing representing the meaning of the word. I provided the target word and pushed a block forward as the participant provided the sounds in the word. At the end of the task, the I repeated the sounds and counted the number of blocks used. For example, "The word /p/-/i/-/g/ has three sounds."

Data Measures During Instruction

Measures Generated by the Instruction

In order to measure the immediate effects of the instruction on the participants' abilities to engage in guided invented spelling, identify rime patterns, and spell new words sharing the identified rime patterns, each instructional session was analyzed. I viewed the videotaped lesson and recorded the participants' responses to each instruction session.

Periodic Checks

In order to examine the effects of the instruction on the participants' abilities to read and spell both taught words with high and low frequency rime patterns and untaught words with high and low frequency rime patterns, two-minute periodic checks were taken once a week. During instructional weeks with fewer sessions, checks were taken after the instruction session. For example, during week three of the instruction, only three sessions occurred. As a result, periodic checks were taken after the third session. A measure did not occur during the final week since only two additional sessions occurred. A total of five periodic checks occurred during the instruction phase of the study. A word list was constructed to measure each of the following: reading two high frequency rime patterns taught during that week, reading two high frequency rime patterns not taught in the instruction, spelling two words with a high frequency rime pattern taught during the week, and spelling two words with a high frequency rime pattern not taught in the instruction. Each word was assigned a number 1-16. Words for the periodic checks were selected through use of a random number generator (True Random Number Service, 1998).

To measure the reading and spelling of taught words with high frequency rime patterns, the rime patterns that were taught during *Making Words* and represented on the

Wylie and Durrell (1970) list of high frequency words were located in the Educator's Word Frequency Guide (Zeno, Ivens, Millard, & Duvvuri, 1995) and a list of possible words containing the rime was created for each. All words taught in the instruction, nonwords, and abbreviations were eliminated from the list. Abbott (2001) used a third-grade median standard frequency index (SFI; Carroll, Davies, & Richman, 1971) of 45 or more as a division between high- and low-frequency words. Consequently, in this study, words with an SFI of 45 or less were considered low-frequency words which meant that third graders would not likely know the meaning of the words and would rarely encounter the words in text, and thus, were eliminated as possible words used for periodic checks. Words with an SFI of 46 or higher were considered high frequency, commonly understood words that would be frequently found in primary-level texts. A similar criteria was followed for this study. The average SFI was 55 on the taught list and 52 on the untaught list. Pre- and post instruction tasks consisted first of spelling the 16 words and then reading the same set of words. Words from this list were randomly selected for the periodic checks. Credit was given toward words spelled and read correctly according to the rime pattern.

To measure the reading and spelling of untaught words with high frequency rime patterns, the rime patterns that were not taught during *Making Words*, but were contained on the Wylie and Durrell (1970) list, were located in the *Educator's Word Frequency Guide* (Zeno et al., 1995) and a list for each rime was created. All nonwords and abbreviations were eliminated from the list. Words with a range of SFI were selected while an average SFI of 46 was maintained. Pre- and post instruction tasks consisted of first spelling the 16 words and then reading the same words from the list. Words from this list were randomly selected

as the words for periodic checks. Credit was given toward words spelled or read correctly according to the rime pattern.

The periodic checks in this study represented time-efficient options that: (a) did not interfere with the instruction time frame itself, (b) reduced the likelihood of inattention and negative behaviors due to extended periods of assessment (Horner & Baer, 1978; Tawney & Gast, 1984), and (c) resulted in an avoidance of reactivity to any of the assessment tools (Barlow, Nock, & Hersen, 2009). By measuring variability of the multiple dependent variables of reading and spelling both taught and untaught words over time, effectiveness of the instruction could be established (Horner et al., 2005) and the validity of this design was increased, thus lessening the likelihood of effects due to other factors, such as maturation or history (Barlow et al., 2009). For all of these reasons, probes or periodic checks are frequently used with students with identified special needs; for example, Cupples and Iacono (2002) probed the full set of 30 training words and 30 generalization words at the beginning of each instruction session for a total of six periodic checks in their study.

Follow-up checks were designed in an effort to provide additional evidence that would validate the effects of the instruction. Maintenance of the effects of this instruction were measured using checks every two weeks for a total of six weeks following the completion of the instruction. Table 2 summarizes how each research question was addressed, how it was measured, and the frequency of the measurement.

Table 2

How Each Research Question Was Measured

Research Question	Frequency of Measure and Task		
	Pre/Post	Weekly	Daily
What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to read words with high frequency rime patterns taught in the instruction?	QRI-3 Z Test Taught Master List	periodic check	
To what extent does this ability transfer to reading untaught words with high frequency rime patterns?	QRI-3 Z Test Untaught Master List	periodic check	
What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to spell words with high frequency rime patterns within and beyond the lessons?	Taught & Untaught Master List	periodic check	data generated from lessons
To what extent does this ability transfer to spelling untaught words with high frequency rime patterns?	Untaught Master List	periodic check	
What are the effects of a spelling-based phonics instruction strategy on the ability to indicate growth and development of phonemic awareness and orthographic knowledge?	QIWK		
What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to segment words?	Segmentation Task		
What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to use a limited set of letters to engage in word-making?			data generated from lessons
What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to identify rime patterns within a limited set of words?			data generated from lessons

Peer Review

The instruction sessions were videotaped using a camcorder in order to examine the fidelity of the treatment and nature of the participants' errors. The camcorder focused on the hands of the participants in order to document letter usage, sorting activity, and word spelling. Participants physically moved letter cards in order to complete these guided spelling activities. The participants' responses were recorded for all of the instruction sessions. Extensive discussions with an expert in literacy instruction for students with disabilities occurred throughout the study to corroborate the observations and findings.

For the word-making step, an established prompting hierarchy was recorded. During this step, participant responses were recorded as correct without help, correct with cues, or model provided. For the sorting step, the participants' responses were recorded based on the order of word selection. For the transfer step, information on the correctness of rime selection and spelling of each word was recorded.

Internal and External Validity Issues

Since case study research falls within the category of empirical social research, the quality of the design is examined under these parameters. Two of these areas that are examined are internal and external validity. Internal validity is often not a concern in descriptive and exploratory case studies since causal statements are not being made (Yin, 1994). In this exploratory case study, I took care to insure internal validity both in the selection and implementation of the literacy intervention, and in the assessments used to measure student growth, since the study focus was on the efficacy of this literacy intervention with youth with DS. All sessions during the study were recorded and reviewed. In addition, peer review provided yet another measure of validity to the study.

Yin (1994) contends that the broader issue in case study research is that of making inferences. When something is not directly observed, it is considered an inference. In case study research, causal relationships are sought in an effort to show how certain conditions are believed to lead to other conditions. These inferences are then supported within data analysis through methods such as pattern matching, explanation building, and rival explanations (p. 35).

Pattern matching was used to support this exploratory case study. The method of pattern matching seeks to relate empirically based patterns with a predicted pattern and may be related to dependent, independent, or both variables (Yin, 1994). Use of multiple measures insured that data could be analyzed from several collection methods. The repeated measurement over time of the dependent variables with periodic checks provided brief, weekly measures that represented a random sample of the participant progress on the variables being measured. Specific accounts of all data collection instruments as well as current skill levels of participants further protected the internal validity of the study. Replication of the effects of the instruction over the different participants further increased the degree of internal validity. Extensive support for the internal validity was provided by the use of logical models from typically developing children and by addressing rival explanations for the patterns and explanations obtained.

External validity is the extent to which a finding from the experiment can be generalized (Yin, 1994). When the findings are representative of the larger population of interest, a study is said to have external validity. External validity was addressed in this study in a number of ways. By providing detailed descriptions of the participants, setting, and methods for participant selection, other researchers could conduct a similar study or use

this study to inform their own research. In addition, the documentation of the effects of the instruction with multiple participants improved the likelihood of generalization to similar populations. Most important in case study research is the linking of results to theory (Yin),which is done in the current study, thereby providing further external validity.

Instruction

Four study participants were provided with spelling-based phonics instruction consisting of the *Making Words* strategy. Stahl, Duffy-Hester, and Stahl (1998) classified contemporary phonics approaches into three categories: spelling-based, analogy-based, and embedded phonics approaches. Of these three, spelling-based approaches were defined as approaches to phonics instruction that used spelling principles. For example, word study based on how orthographic knowledge develops (e.g., Bear, Invernizzi, Templeton, & Johnston, 1996) was characterized as one such approach using spelling principles. Stahl, Duffy-Hester, and Stahl (1998) categorized *Making Words* similarly.

The use of instruction that employs an onset-rime approach with children with DS has research support. Cupples and Iacono (2002) have suggested that onset-rime instructional strategies may reduce some of the abstraction associated with instruction that focuses more on individual phonemes. An instructional strategy with an emphasis on rimes may reduce the short-term memory demands for individuals with DS (Cupples & Iacono, 2000, 2002).

The strategy lessons were taken from *Making Words First Grade* (Cunningham & Hall, 2009). Since *Making Words* was designed as a classroom strategy rather than a one-on-one instruction strategy, slight adaptations were necessary. In a classroom setting, one student builds the word for the class once all students have made the word at their desks. Then, students have time to change any incorrect spellings independently. For this study, I

displayed a card with the word correctly spelled on it while working one-to-one with each study participant. Instruction was delivered one-to-one to accommodate individual schedules. The participants had the opportunity to compare and contrast their spellings to that on the card and then make corrections. I used this time to discuss the participants' spellings with them. For example, when an error occurred, I was able to engage in conversation similar to the following: "You spelled *cat* and the word is *chat*. You're right, -*at* is part of this word and so is the letter *c*. But there's an additional letter that combines with *c* to make a new sound. Can you choose from the remaining four letters so that the word spells, *chat*?"

I conducted the instruction over a period of six consecutive weeks which yielded a total of 23-24 lessons per participant. Prior to the beginning of each instructional lesson, I took two to three minutes to establish rapport with the participant. Each lesson was expected to average 20-30 minutes based on clinical evidence (Hall & Cunningham, 1996; Cunningham, Hall, & Sigmon, 1999), resulting in nine to ten hours of instruction. Two previously reviewed phonics studies with children with DS (Cupples & Iacono, 2002; Goetz et al., 2008) were examined closely in order to determine an appropriate instructional time frame. With similar participants as those being sought for the proposed study, Cupples and Iacono (2002) taught two separate groups of children with DS, ages 8-11 years with little or no nonword-reading ability, over a period of six weeks in hour-long sessions. Significant results were obtained. Goetz et al. (2008) completed a phonics-based reading instructional program that focused on phoneme segmentation and blending skills in the context of letter-sounds and used words in books in a one-on-one setting. The 15 students, ages 8-14 years, were described as having emerging reading skills. The first group of eight students received

the instruction for 40 minutes a day over 16 weeks for a total of 53 hours. The second group of seven students received the instruction for the same amount of time per day over eight weeks for 26.5 hours.

The *Making Words* strategy consists of three steps. The first step of the lesson consisted of guided spelling. The spelling approach of this step focused on learning letter sounds, segmenting words, and blending letters, and is not designed as a method to increase sight word vocabulary (Cunningham & Hall, 2009). Students were given a pre-determined set of six to eight letters of the alphabet written on cardstock. Students were directed to form certain words, beginning with two-letter words and then building up to increasingly longer words. For example, the student might receive instructions to use two letters from the set to spell the word *at*. I then used the word in a sentence and repeated the word but did not sound it out. By only repeating the word, I gave the students the opportunity to use their knowledge of the letters and sounds independently. Once the student had made an attempt, I displayed an index card with the word written on it and said, "This is how I spell *at*. Does your word look like mine?"

Once the student had ample time to answer the question and correct the spelling as necessary, the lesson continued. The student was then given instructions on making the next word, which built on the previous word. For example, I might say, "Add one letter to *at* to spell the word, *hat*. I wear a *hat* when it is cold outside. *Hat*." Each lesson had 8 to 12 words in the making words step. All words made during this step of the lesson were written on index cards.

The second step of the lesson consisted of visually identifying and sorting some of the words that had been compiled as the student spelled them in the word-making step. This

part of the lesson focused on some of the orthographic patterns that were the same in two or more words made in the lesson (Cunningham & Creamer, 2009). During this step, the student manipulated the index cards generated from the lesson. This required the student to not only focus on the similarities of the letters, but also the patterns in the words presented. For example, I chose a word from the set of cards and asked the student to find a word that looked like or rhymed with it, "Can you find a word that rhymes or looks like *cat*?"

The final step of transfer allowed children to practice using the patterns from the day's lesson to spell new words. This part of the lesson was designed to help children make the connection between familiar letters and patterns in order to decode and spell an unknown word (Cunningham & Hall, 2009). In other words, children learned how to generalize their knowledge of letter-sound relationships and familiar words to read and spell new words. For example, if a lesson included the words *an* and *can* as a pattern, the student might be given instructions similar to the following: "If you wanted to spell the word *man*, which word from today's lesson would help you spell *man*?" Then the word was used in a sentence and then repeated once more. The student wrote a response on paper. As in the first step, the word was repeated, but not sounded out. A total of approximately three to four words per lesson was spelled during this step. A sample *Making Words* lesson is provided in Appendix D.

It is important to note the nature of error correction throughout the *Making Words* lesson. I avoided terminology such as *incorrect* or *wrong*. Instead, each step maintained the integrity of the guided discovery approach (Cunningham & Hall, 2009). I guided the student through each step of the lesson. By doing so, the students had the opportunity to compare and contrast their responses with the letters or words from the lesson.

Participants in the current study all began instruction on the same day. Three to four periodic checks occurred prior to the instruction. These checks served dual purposes. First, the checks served as a way to familiarize the participants with the procedures that would be used throughout the study. Second, the checks provided additional information on the beginning levels of each participant. Periodic checks that measured the students' ability to read and spell rime patterns, both taught and untaught, were employed.

Data Analysis

Data for this study were analyzed in three ways. First, the reading and spelling measures were examined to determine if there were correlations. Second, the taught and untaught words were contrasted to determine whether there was evidence of the participants' use of the *Making Words* strategy. Third, the daily instruction progression was analyzed for patterns.

Research questions one through four concerned the effects of the instruction on the participant's ability to read and spell words with high frequency rimes taught during *Making Words* as well as the participants' ability to read and spell untaught words with high and low frequency rimes. Data from the periodic checks for the reading of words were analyzed by the number of words, onsets, and rimes read correctly. Data from the periodic checks for the spelling of words and the daily within-lesson measure were analyzed by the rimes accurately represented and the number of words spelled correctly by each participant.

In addition to the periodic checks, the Z Test, QRI-3, and Taught & Untaught Master List were administered at pre- and post-instruction and results were organized in chart form. Growth was determined both quantitatively, by the percentage of change in scores, and qualitatively, by analyzing the nature of the errors.

Additional analysis occurred for question three which examined the spelling of words within and beyond lessons. Data generated from within the lessons were scored based on correct overall spelling.

Data for question five, concerning growth and development of phonemic awareness and orthographic knowledge, were determined by the pre- and post-instruction test results from the QIWK. The QIWK was scored by the number of correct phonemes in the correct position of the word. Results were organized in chart form.

For research question six, concerning segmentation and blending, the segmentation task was administered at pre-test and post-instruction and results were organized in chart form. Growth was determined by the percentage of change in scores.

Data for question seven concerning the guided invented spelling step were analyzed by the levels of prompting hierarchy necessary for the participant to successfully make the word. Five levels of prompting hierarchy have been identified: Correct without help, using error correction techniques, and correct with help. Error correction techniques were based on the nature of the misspelling and included the following types of cueing feedback: "You used four letters to change *set* to *net*, but we only had to change one letter;" "You changed the last letter but the cue told you to change the first letter. Which letter is first? Can you change that one to spell the word, *net*?" or "I am pointing to two of the letters that you will use to spell the word, *net*. Which of the remaining three letters could you use to spell *net*?" If the participant was unable to make the word after error correction techniques, then the word was revealed on the index card. The participant then used the model and made the word. The daily data were graphed and visual patterns analyzed by level, trend, and variability within phases and between phases of the design (Kennedy, 2005). The slope and magnitude of the

data were used simultaneously to determine trend direction. Growth was determined by decreased levels of assistance required by the participant.

Data for question eight concerned the identification of rime patterns (sorting step). Lessons were examined for the number of words each participant correctly sorted without researcher assistance.

Study Follow-up

After completion of the study, parents and teachers were offered an opportunity to learn about the study findings. Training was provided in use of the *Making Words* strategy and literacy materials were shared.

Summary

Through use of a case study design, the effects of one type of word instruction were examined. Participants received 23-24 lessons in *Making Words* (Cunningham & Hall, 1994, 2009). The participants' progress in ability to read and spell words with high frequency rime patterns, both taught and untaught, was examined in pretests and posttests, periodic checks, and daily measures. A combination of quantitative and qualitative methods were incorporated into data analysis.

CHAPTER 4

RESULTS

The purpose of this study was to examine the effects of a spelling-based phonics approach to word instruction in children with Down syndrome. After four participants were selected, a variety of measures was employed before, during, and after the six-week instruction. Table 2 in Chapter 3 provides an explanation of the measures used to respond to each research question. In this section, timeline information is provided and results are reported in accord with the respective research questions.

Once the four participants were selected, the various phases of the study began and are provided in Table 3.

Table 3

Phases of Instruction

Phases of study	Type of data collection	Amount of time per phase
Phase 1	Pretest measures	2 days
Phase 2	Procedures prior to instruction	4 days
Phase 3	Procedures during instruction	23-24 days
Phase 4	Posttest measures	2 days
Phase 5	Follow-up procedures	3 intervals of 14 days each

First, pretest measures were administered. A one-week time lapse occurred between the conclusion of pretest data collection and data collection procedures prior to instruction. Once data collection procedures prior to instruction occurred, the instruction began and continued

for five to six weeks. Following completion of the instruction sessions, posttest data were collected as well as follow-up periodic checks every two weeks for six weeks after the instruction.

Session Overview

Three participants, Kate, Tina, and Jack, were absent for one of the instructional sessions, resulting in a total of 23 sessions for each of them. Mark did not miss any instructional sessions, resulting in a total of 24 sessions.

Sessions ranged in length from 12 minutes to 38 minutes, and the average session required 25 minutes. This average was comparable to classroom implementation which typically requires 15-20 minutes for typically developing children (Cunningham, Hall, & Sigmon, 1999; Hall & Cunningham, 1996). All of the lengthier sessions occurred during the first 12 sessions while all of the shorter sessions occurred in the last 12 sessions, suggesting growing comfort by the participants with the instructional procedures. The total instructional time for each participant ranged from 9 to 10 hours. Table 4 provides information on the length of time that the shortest and longest lessons required, as well as the lesson number in which they occurred.

Table 4

Length of Sessions

	Kate	Mark	Tina	Jack
Longest lesson/ lesson number	30:12/12	37:30/ 6	32:00/ 2	34:28/ 6
Shortest Lesson/ lesson number	15:15/ 20	12:22/ 20	16:42/18	19:38/ 24
Average session length	24:11	26:08	25:05	25:27

Variation in the session length is related to a number of factors. The shorter sessions during the last 12 sessions with all of the participants indicated that the participants became familiar with the instructional approach over time. In addition, I became more familiar with the participants, their speech, and the behaviors that were exhibited. All of these factors resulted in more efficient lesson delivery over time.

In the following section, data are organized by the research question they address.

Questions 1 and 2

The first two research questions examined the participants' ability to read words with high frequency rime patterns, both untaught patterns and patterns taught during the instruction. The questions were answered through a series of pre-and post-tests as well as the periodic checks.

Question 1: What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to read words with high frequency rime patterns taught in the instruction?

Question 2: To what extent does this ability transfer to reading untaught words with high frequency rime patterns?

Pretest and Posttest Results

Three different pre- and posttests provided data that addressed these questions: QRI-3, Z Test, and the Taught and Untaught Master List. As a whole, all four participants put forth a great deal of effort during these tests. Their overall strong work ethic was indicative of their performances throughout the study. Despite the participants' good efforts, however, none of the pre- and posttests appeared to capture the differences in progress. Results for each are provided in Table 5.

Table 5

Results from Pretest and Posttest Tasks for Questions 1 and 2

	Kate		Mark		Tina		Jack	
Task	Pre	Post	Pre	Post	Pre	Post	Pre	Post
QRI-3[a]	30.0	60.0	20.0	20.0	5.00	10.0	0.00	5.00
Z Test[b]	16.0	11.0	0.00	0.00	0.00	0.00	0.00	3.00
Taught Reading[c]	25.0	6.00	0.00	0.00	6.00	6.00	0.00	0.00
Untaught Reading[c]	13.0	19.0	0.00	0.00	0.00	0.00	0.00	0.00

[a] Scores represent the percentage of correct responses at preprimer level.
[b]Scores represent the percentage of words read correctly by the participant.
[c]Scores represent the percentage of words or rimes read correctly.
*All percents at .5 or above were rounded up.

QRI. For the QRI, participants were asked to read a list of 20 words from a pre-primer list. Kate refused to read the entire word list at pretest. She did read three of ten words correctly and substituted real words, two of which contained the same initial sound and two which contained the same final sound, as the test items. For example, she read the word, *too*, as *who*. Because of Kate's familiarity with sight words, I opted to administer the primer list of the QRI-3 although criteria were not met at the pre-primer list during the posttests. Kate read the complete pre-primer list, reading 12 of the words correctly, and was also able to read four words on the primer list. On the pre-primer list, she substituted six words with the same initial sound and one word with the same final sound. For example, she read the word, *my*, as *by*. On the primer list, she substituted nine words with the same initial sound; two of these substitutions were digraphs (e.g., *chicken* for *children*). She also substituted five final sounds correctly (e.g., *send* for *need*). Two words contained the same rime as the targeted word (e.g., *hot* for *not*).

Little change was noted in Mark, Tina, or Jack's ability to read words from the pre-primer list. Mark read the same words accurately at pretest and posttest. He substituted a word with the same initial sound for five words at pretest and for one word at posttest. At pretest and posttest, he would often name the first letter in the test item. For example, he read the word, *work*, as *w*.

Tina increased her ability to read words from the QRI-3 list by one word. At pretest, one of Tina's substituted words contained the accurate initial sound and one contained the accurate final sound. For example, she read the word, *at*, as *it*. At posttest, she substituted a word with the same initial sound for six words. For example, she read the word, *can*, as *car*.

Jack correctly read the word, *see*, at posttest. With the exception of three substitutions of real words at pretest, Jack substituted a letter only for the words at pretest and posttest. Of these substitutions, he named the ending letter for five words at pretest. At posttest, he named the first letter for five words and the ending letter for two words. Jack substituted one real word containing the same initial sound as the test item when he read the word, *can*, as *call*, at pretest.

Z Test. The Z Test required participants to read a total of 37 words, 32 of which were nonsense words and 5 of which were real words. Kate read two fewer words at posttest than pretest. At pretest, she substituted a real word for all but one of the test items. She accurately read the rime of three of the test items, but did not receive credit since she did not pronounce these with the letter *z* or another onset. For example, she received credit for reading the test item, *zip*, as *ship*, but did not receive credit for reading the item *zat* as *at*. At posttest, she substituted her own nonword for nine of the items and substituted real words for the other items. Three of the items she read accurately at posttest were also read accurately

at pretest. She received credit at pretest and posttest when she read *hill* for *zill* and *jump* for *zump*. For the test item, *zore*, she received credit for reading the word as *sore* at pretest and *store* at posttest.

Mark and Tina were unable to read any of the items accurately. At pretest, Mark repeated the non-word, *zut*, for all but one of the test items. Before reading each word at posttest, he would spell it aloud. While he was unable to read any of the words accurately, his pronunciations seemed to be more intentional. He substituted nine variations of the words, including two real words, *zip* and *zipper*.

At pretest, Tina would often spell the word aloud and then pronounce a word or non-word. Twenty-one of her substitutions contained the onset of *z* and six of the words were real words. At posttest, Tina substituted 24 real words. These substitutions were often words that contained one letter from the test item. For example, when asked to read the test item, *zip*, Tina said, "*P*. *Peace*."

Jack's pretest performance consisted of producing the letter sound of *z* repeatedly, and then saying a letter name at the end. For example, when asked to read the test item, *zick*, Jack said, "*Zzzzzzz*. *T*." Jack was able to read the test item, *zeat*, accurately at posttest. Like his pretest performance, Jack produced the letter sound of *z* for 18 items. He substituted a word or non-word for 11 items and the letter *z* along with a letter or word for 6 items. For example, Jack read the test item, *zack*, as *trout*, and the test item, *zop*, as *Z- T*.

Taught and Untaught Master List of Words. With the Taught and Untaught Master List of Words, participants received credit for reading the rime or the word in its entirety correctly. On the Taught list, Kate read one word and three rimes correctly at pretest. She substituted six words with the correct initial sound and one word with the correct initial and

final sound. At posttest, she read one rime correctly, substituted four words with the correct initial sound, and three words with the correct initial and final sound. For example, she read the rime of the word *top* correctly when she said *stop*. On the Untaught list, she read one word and one rime correctly at pretest and one word and two rimes correctly at posttest. At pre- and posttest, she substituted real words with the correct initial sound for six words and real words with the correct initial and final sounds for three words. For example, she read *bake* as *bike*. At posttest, she also substituted a word with the correct final sound twice.

Mark and Jack were unable to read any of the words correctly at pre- or posttest. At pretest, Mark named the first letter of the word or substituted a real word that sometimes contained the same initial sound, on the Taught and Untaught lists. For example, when asked to read the word, *pit*, he read *pick*. On the Taught list at posttest, Mark named the first letter of each word with few exceptions. One such exception occurred when he read *kit* as *cat*, both at pretest and posttest. Except for two words on the Untaught list, Mark read each of the letters of the words aloud and then provided a real word. He named four real words with the same initial sound. For example, he read *work* as *wasp*. However, he frequently named a word that was seemingly unrelated. For example, he read *dump* as *golf*.

At pretest, Tina spelled parts of the word before providing a real word or non-word on both lists. For example, when asked to read the word, *fin*, she spelled the letters j-t-t and said the non-word, *teace*. She named 14 real words, five of which had the same initial sound as the target word. However, she did name the rime, *-it*, in the word, *pit*. She read this word accurately at posttest as well. Similarly to the pretest, she spelled parts of the word and named a combination of real words and nonwords at posttest. She named 18 real words, and six of these words had the correct initial sound as the target word.

Jack named letters, with the exception of three occasions, when asked to read words from the Taught and Untaught list at pretest. Of the two lists, he named two beginning letters and six ending letters. At posttest, Jack named three words with the same initial sound, including the word, *bee*, for the target word, *bay*. Of the two lists, he named ten beginning letters and six ending letters at posttest. For example, Jack read *t* for the word, *top*.

Results of Periodic Checks

All words for the periodic checks were randomly selected from the Taught and Untaught Master Lists. Checks occurred prior to instruction, during the instruction, and after the instruction. A look at the individual pronunciations of words revealed a progression in ability to read words over time.

Tables 6 and 7 contains the participants' pronunciations. Correct pronunciations were indicated with an asterisk (*). If a letter was named instead of a pronunciation of a sound, only a letter was recorded in the chart. If a series of letters were named, the letters were recorded with a dash (-) between each letter. A dash (-) itself indicates that data was not collected. If a combination of sounds and letters were produced, the sounds were recorded within the symbol, forward slash (/), and then the letter pronounced was recorded.

Pre-instruction. Participants were asked to read four words, two taught and two untaught, on separate days. Kate and Mark read a total of 12 words prior to instruction over the course of three consecutive days; Tina and Jack read 16 words prior to instruction over the course of four consecutive days. Participant performance across Taught and Untaught lists was consistent.

Prior to instruction, the participants had not been taught any of the words or rimes, and had not received any instruction. Table 6 provides the results of the periodic checks

from the reading of words containing rimes to be taught during the instructional piece. The checks taken at this time served as a measure of how well the participants knew the material prior to instruction.

Table 6

Results from Periodic Checks: Reading Words to be Taught Prior to Instruction

	Pronunciation of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
chat	chair	sane	sk	z
lip	chip#	kuh	ice	pet
bring	thing#	dog	b	t
kit	at	cat	cup	k
tight	signs	t	tup	c
pack	bike	p	pot	k
pay	-	-	brit	g
top	-	-	hipped	v

#rime read correctly
-data not collected on these words

Kate readily responded without hesitation when presented with a word. She read the correct rime pattern of two words, *chip* and *thing*. She consistently substituted a real word when unfamiliar with the word. Her substitution of *chat* for *chair* had the correct *ch-* digraph.

Mark seemed to be focused throughout periodic checks. Of the four participants, the format of the checks seemed to be most advantageous for him due to his shorter attention span. He was unable to correctly identify any of the rimes or words. He would sometimes name the beginning letter itself when he was unable to produce a word. For example, he said *t* for *tight* and *p* for *pack*. At times, he would substitute a real word. For example, he read the word *bring* as *dog*.

During each periodic check, Tina carefully examined each word before pronouncing. She seemed to put forth a great deal of effort in her task. She frequently named real words and nonwords prior to instruction. She named one non-word and one real word with the correct beginning sound as the target word when she pronounced *tup* for *tight* and *pot* for *pack*.

Jack also put forth a great deal of effort throughout the checks. He would scan the word carefully, often pointing to the letters with his finger, before reading the word. He frequently named a letter only and the named letter was only sometimes in the word. He read *chat* as *z*, and *pack* as *k*. He made a real word substitution when he read *pet* for *lip*.

Results of the periodic checks on the Untaught list prior to instruction are presented in Table 7. Participants were asked to read words containing high frequency rime patterns not taught during any phase of the instruction.

Table 7

Results from Periodic Checks: Reading Untaught Words Prior to Instruction

	Pronunciation of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
luck	lunch	i-u-c-k	i-i-i	prince
lick	like	i	im	k
nap	hot	n	you	k
pest	pets	baby	peace	v
fail	fish	fish	hoped	gaypee
lock	bike	i	elst	k
woke	-	-	bruum	k
tore	-	-	seem	o

-data not collected on these words

Kate continued to make real word substitutions when reading words, and four of those words had the same beginning sound as the target word. For example, she substituted *lunch* for *luck*, and *like* for *lick*.

Mark continued to make real word substitutions, such as *baby* for *pest*. In addition, he would name a letter, which was sometimes in the word, as well as spell the word, letter by letter. For example, when presented with the word, *lock*, he said, "*i*." When presented with the word, *luck,* he said, "*I-u-c-k*."

Tina continued to name real words and nonwords, with only one having the same beginning sound as the target word. For example, she read the word, *pest*, as *peace*. When asked to read the word, *lock*, she responded with the non-word, *elst*.

Jack continued to name a letter for many of the words, although the letter was not always in that word. For example, he named the letter *v* when asked to read the word, *pest*. He substituted the real word for one of the words when he responded with *prince* for the target word, *luck*.

During Instruction. While participating in the instruction lessons, periodic checks were taken on a weekly basis. Each week, participants were asked to read two words on the Taught list and two words on the Untaught list. Table 8 contains the results of the words from the Taught list.

Table 8

Results from Periodic Checks: Reading Taught Words During Instruction

	Pronunciation of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
tight	get	tap	tipst	shell
lip	put	i-p	elst	k
dot	doctor	pot#	peet	o
pay	play#	part	peace	o
that	that*	tippy	eat	k-o-t
fin	fine	fish	teat	fish
tight	visit	t	tum	g-p
van	vase	v-a-n	veet	v
that	that*	little	toulm	t
top	stop#	t	tim	t

*word read correctly
#rime read correctly

Kate correctly read two rimes and two words during instruction. She correctly read the rime when she substituted the word, *play*, for *pay*. As well, she substituted three words with the same beginning sound as the target word.

Mark named words more frequently than letters during instruction. He substituted words with the same initial sounds for four words. He correctly read one rime when he substituted *pot* for *dot*.

Tina was unable to correctly read any of the rimes or words. Like the checks prior to instruction, she used a combination of real words and nonwords, six of which had the same beginning letter. For example, she substituted the word, *peace*, for *pay*.

Jack mainly named letters, although real words were named twice. For example, he read *tight* as *shell* and *fin* as *fish*. Letter naming, without a word or non-word, was more frequent throughout the periodic checks.

Table 9 explores the nature of the pronunciation of the words from the Untaught list.

Table 9

Results from Periodic Checks: Reading Untaught Words During Instruction

	Pronunciation of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
tore	door#	teacher	/t/-um	p
pain	pole	p	/p/-ot	t
hill	hill*	h-i-h	jam	p
tame	thumb	tame e	t	v
woke	walk	water	dubs	zero
shell	she	slick	seal	/cptit/- see
dump	down	bob	bit	g
sank	sock	s	sim	s
pest	pet	p	pet	b
fail	face	fish	timps	fish

*word or rime read correctly

Kate correctly read the word, *hill*. She correctly named a rhyming word for *tore* when she substituted the word, *door*. She substituted words that were often visually similar to the target word. For example, she read *sank* as *sock*, and *pest* as *pet*. Eight of the words had the same beginning sound or same beginning letter. For example, she substituted *tame*, which has the same beginning letter, but not the same beginning sound of *th-* as *thumb*. She correctly substituted a word with the same beginning digraph of *sh-* when she substituted *she* for *shell*.

Mark continued to name real words, and some had the same initial sound as the target word. For example, he named *teacher* for *tore*. He mostly named a letter or word for each targeted word.

Tina continued to name real words and nonwords, with three of these having the correct initial sound, and one with the correct beginning letter. For example, she substituted the non-word, *sim*, for *sank*. She was unable to correctly read any of the rimes or words.

Jack continued to name letters as well as three words. He substituted a real word with the correct initial sound when he read *fail* as *fish*.

Post instruction. After instruction, periodic checks occurred over the course of six weeks in the summer. I completed periodic checks on three occasions with the participants. Results for words from the Taught list are presented in table 10.

Table 10

Results from Periodic Checks: Reading Taught Words Post Instruction

	Reading of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
fin	face	fish	eat	p
kit	sock	cat	/k/-king	k
that	that*	tim	t	t
wheat	won't	water	dubs	p
chat	at#	cat#	seat	p
lip	chip#	i	peat	p

*word read correctly
#rime read correctly

Kate correctly read one word and two rimes. She had previously read the rime, *-ip*, correctly during a periodic check prior to instruction. This is indicative of consistency in her performance. Toward the end of the instruction, Kate's reading of words used for periodic checks contained more of the beginning sounds or the beginning letters. For example, she read *fin* as *face*.

Mark read one rime correctly when he named *cat* for the target word, *chat*. Measures taken at post instruction indicated a more frequent use of initial sounds. For example, he read the word *fin* as *fish*. Overall, this strategy of using the initial sound and a word with that sound represented progress from his initial readings of words in periodic checks. Mark

seems to have developed a more sophisticated understanding of words and sounds as he progressed through the instruction.

Tina was unable to read any of the rimes or words correctly. At post instruction, Tina was naming real words more often, though little attention to beginning sound or rime was indicated. For example, she read *eat* for *fin,* and *peat* for *lip*.

Jack named letters only exclusively at post-instruction. He did name the beginning letter of the words more frequently than prior to instruction.

Table 11 contains the pronunciations of words from the Untaught list following instruction.

Table 11

Results from Periodic Checks: Reading Untaught Words Post Instruction

	Reading of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
shell	will	/sh/-s	/s/-timp	p
sank	sock	c	/ke/-eat cat	k
pest	put	pot	peace	b
hill	hill*	h	choke	p
lick	like	i	cat	k
bake	bike	ball	beat	p

*word or rime read correctly

Kate correctly read the word, *hill*, which she had also read correctly at a periodic check during instruction. Toward the end of the instruction, Kate's reading of words used for periodic checks contained beginning sounds and beginning and ending sounds. For example, she read *sank* as *sock*. This also provides an example of her continued use of visually similar words. Her substitution of the word, *bike*, for *bake*, is another example, of a similar word containing a similar pattern. This progression seems to indicate a greater attention to the word as a whole rather than initial letter and sound only.

Mark continued to demonstrate a more frequent use of initial sounds. For example, he read the word *bake* as *ball*. He continued to name a letter at times. For example, he was unable to substitute a word for *lick*, and named a letter within the word.

Tina continued to name real words more frequently. For example, when asked to read *bake*, she did say *beat*; however she read, *choke* for *hill*, demonstrating little attention to the beginning sound.

Jack named letters only exclusively at post-instruction. He named the letters *p* and *k* with the greatest frequency. Though clearly difficult for him, Jack continued to maintain a positive work ethic throughout the tasks.

Collectively, the pre- and posttest data showed that the participants made no measurable growth in their ability to read sight words or rimes, whether taught or untaught. While Kate appeared to show progress in her ability to read words on the QRI-3, actually, she maintained greater attention to the task at posttest. Her lower pretest score was indicative of her inability to maintain focus in order complete the task. Unlike pretest performance, Kate was able to complete the sight word task at posttest. The change in her ability to read high frequency rimes, both in the Z Test and real words, suggests attention but not learning since performance increased slightly on untaught rimes and decreased slightly on taught rimes.

Periodic checks prior to instruction showed that three of the participants were unable to read any of the rimes in the taught and untaught words correctly while Kate was able to read two correctly. Periodic checks during instruction showed that all of the participants directed attention to letters and sounds within the target words. However, only Kate, with six, and Mark, with one, were able to get any correct. At post instruction, periodic checks

indicated performance comparable to that demonstrated during instruction. Kate read four of 12 target rimes correctly and Mark read one of 12 rimes correctly.

Questions 3 and 4

These questions examined the participants' ability to spell words with high frequency rime patterns, both untaught patterns and patterns taught during the instruction. Pre- and posttests, periodic checks, and data generated from the lessons provided information to respond to these questions. All spelling tables mirror that of the participants. For example, if the participant wrote an upper case letter, the table is reflective of such. Letters in the tables in bold type represent those for which the participants received credit and are described in the results.

Question 3: What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to spell words with high frequency rime patterns within and beyond the lessons?

Question 4: To what extent does this ability transfer to spelling untaught words with high frequency rime patterns?

Pretest and Posttest Results

The participants were asked to spell the complete Taught and Untaught Master List of words before and after instruction. Each list was administered on different days and all four participants used a pencil to write the words. Table 12 shows the pretest results of the spellings of words to be taught.

Table 12

Pretest Results from Spelling of Words from Taught Master List

	Pretest: Spelling of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
bay	P	piatthed	KJ	**b**eicca
that	P	kimimi	HO	bob
pit	**P**	bia**t**bia	o**T**	deiciey
fin	r	**f**eithihe	**N**P	amermemci
bring	P	pibibilheia	PK	repem**G**Way
wheat	P	f**t**heihe**w**	KL	raicmenai
top	**t**	beinew	dL	Gieme**pp**rercny
lip	f	**p**eify	K**P**	me**p**meooiey
tight	f	4eliaiziolzii2134	HJ	enemGpFaLy
dot	.	piattbia**t**th	ll**d**	ineFEameiemey
van	**V**	feiat	Kll	bonein
tug	D	KlmLi**g**ia	bp	**G**mcmemeFamxy
pack	D	biattheiatth	ll**K**	er
pay	D	3456	**P**L	bih
chat	J	6578	Hll	beialx
kit	D	43ia	llH	dneiebe

Note. *Bold type represents credited sounds*.

Kate readily spelled each word. After hearing the word, she would repeat the word back to me and then write without hesitation. Unlike the other participants, Kate would ask or say, "Hun?" if she wasn't sure what word I had said. She spelled all but one word on the Taught list using one letter only. For the word *dot*, she drew a dot on the paper. She used the letters *p* and *d* with the greatest frequency. She correctly wrote the letter representing the initial sound for three of the words. Finally, she made an insightful substitution of the letter *j* for the *ch* sound when spelling the word, *chat*. Both the *ch* sound and the *j* sound are produced or articulated in the same area of the mouth.

Mark spelled each word with a combination of letters and numbers. Although I understood his pronunciations, Mark had the greatest number of articulation issues. It

became important for Mark to repeat the word back so that I (a) was confident that he understood the word and (b) could become better acquainted with his articulation errors. While spelling each word, he was quite focused, would repeat the word aloud multiple times while emphasizing certain sounds aloud, and did not look at me until he had finished each spelling. On the Taught List, he wrote as many as 17 letters and numbers to represent one word. For example, the word, *tight*, was spelled as *4eliaiziolzii2134*. He represented the beginning sound in two words and the final sound in five words. For example, he spelled *pit* as *biatbia*. While Mark's spelling was out of sequence, he included the final sound, *t*, in his spelling of the word. This may also be indicative of Mark's process for spelling. After I stated the word, Mark would repeat the word, as many as six times, while spelling. While Mark included vowels within his spellings, no pattern of use could be established based on his other spellings.

Tina spelled all of the words on the Taught list with 2-5 letters. Her spellings often contained the letters *k, p, h,* and *l*. Tina would repeat the target word multiple times aloud before writing the word. As she spelled, she would repeat the word, pause, and add more letters. Four of her spellings included the final sounds of the target words. For example, she spelled the word, *lip*, as *KP* and *pit* as *OT*. She used the correct initial sound for two words, including the word, *dot*, which she spelled as *lld*. Although the *d* was out of sequence, her less frequent use of this letter seemed to indicate a strategic choice.

Jack spelled all of the words on the Taught list with 2-13 letters. Because of his soft voice, I asked Jack to make eye contact when repeating the targeted word to make certain that he had understood the word correctly. He would repeat the word, but no more times than requested. He indicated the correct final sound in four words. For example, he wrote

G*mcmemeFamxy* for *tug*. He spelled the correct initial sound of *bay* when he wrote *beicca*. Similar to Mark, a pattern of vowel use could not be established.

On the second day of pretests, the Untaught Master List was administered. Table 13 represents each participants' spelling of the words.

Table 13

Pretest Results from Spelling of Words from Untaught Master List

	Pretest: Spelling of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
nap	S	**p**el	RL	zobo
hill	**h**	234	**ll**o	z**h**c
lick	S	**l**oo	**LK***	zhp
shell	S	5678	**HS**	z**l**oh
pain	P	5-67	UK	zho
pest	S	Eiaia	**P**L	zbeb
bake	P	a5i-85	J**K**	zho
fail	P	piaio**l**	**l**lO	hoe
sank	P	platthe	**K**J	zleh
tame	P	pol-OEaiav	Jll	zaeh
dump	P	10	JK	hoe
tore	P	11	LP	zhoh
lock	P	12	**Sh**ll	hoy
pine	P	13	JKLll	zaol
luck	P	14	PbLll*	zhoe
woke	P	5	PllLR	hoq

Note. *Bold type represents credited sounds*.
*mirror image of the upper case letter, L, was written by Tina

Kate spelled four words with the letter *s* and 11 words with the letter *p*. On two occasions, this was the correct initial sound by chance. She correctly wrote the initial sound of the word, *hill*.

As with the Taught list, Mark used letters and numbers, as well as the symbol for a dash, to spell each word on the Untaught list. He repeated the word aloud multiple times while spelling. He would then write additional letters representing the sounds that he heard. While sometimes out of sequence, it was clear that he was intentional about his letter choice

as he repeated the word. The Untaught list contained fewer lengthy spellings. The spellings were often numbers, such as *11* for the word, *tore*, or three to four letters, such as *looo* for the word, *lick*. His spelling for *lick* represented a correct initial sound. He represented two final sounds in the spelling of the words, *nap*, as *pel*, and *fail* as *piaiol*. While out of sequence in the word, *nap*, it represents the final, salient sound in the word.

Tina spelled each of the words with 2-3 letters. She wrote the correct initial sound for three words, although the letters were out of sequence for one of these. When asked to spell *shell*, she wrote as *HS*. She also spelled the final sound in five words, including *llo* for the target word, *hill*, and *KJ* for *sank*. Another interesting feature of her spellings was the use of a symbol similar to an upside down capital letter *l*. When asked what the letter was, she stated that it was the letter *l*.

Prior to testing the Untaught list, Jack had completed the Z Test. His spellings of the first 6 words on the list began with the letter *z*. At that point, I stopped the pretest and administered the segmentation task. This was done in an effort to transition him out of the Z Test. Once the segmentation task was completed, I returned to the Untaught list. However, Jack continued to use the letter *z* for the initial sound in six of the last 10 words. He did indicate the initial sound of *hill* in his spelling, *zhc*, and the final sound of *shell* in his spelling, *zloh*. Jack rarely repeated the word aloud.

Posttest results showed a gradual transition in spelling development for each participant. Table 14 contains the spellings on the Taught list at the end of the instruction. Similar to pretest, each participant spelled the words using a pencil. All displayed a high level of focus during the task and seemed quite intentional with their spellings.

Table 14

Posttest Results from Spelling of Words from Taught Master List

	Posttest: Spelling of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
bay	J**A**	**p**	**B**	**b**aek
that	Jh**t**	**t**	D	noycb
pit	**t**k	**P**	H	heyok
fin	**f**k	**f**	**f**	**n**ayeb
bring	LLL	P	j*	rhc
wheat	she	r	b	dns
top	h**tt**	D	**t**	ndb
lip	fof	D	H	cno
tight	p**tt**	D	h	henb
dot	fine	**D**	H	riseha
van	fc	**f**	j	to
tug	**t**r	**t**	k	dary
pack	tr/**p**t	D	m	niy
pay	**p**t	**P**	H	**b**is
chat	ju	**t**	H	Kreh
kit	**k**J	**t**	H	**c**ah

Note. *Bold type represents credited sounds*.
*written backwards with tail of letter, j, in opposite direction

At posttest, Kate spelled all of the words on the Taught list with two to four letters. For two of the words, she substituted a real word. When asked to spell *dot*, she wrote *fine*. She correctly wrote the initial sound for six of the words and the final sound with three of the words. For example, she spelled the word, *pay*, as *pt*. On the pretests, Kate had not spelled with vowels. Her use of vowels at posttest revealed a marked change in the way she represented words. She was given credit for the vowel sound in the word, *bay*, due to the salient nature of the sounds and intention that she displayed when spelling the words.

Mark wrote one letter only to represent the spelling of each of the words. He correctly spelled the initial sound of seven words. For example, he wrote *f* for *fin*. While Mark said *b* for the word *bay*, he wrote the letter *p*. He was given credit for correctly

indicating the initial sound since he verbally stated the correct letter and only faced difficulty when deciding how to write the letter. Mark also made a logical substitution of the letter *f* for the initial sound in *van* due to the location of the letter for articulation. He received credit for this substitution. He wrote the correct final sound for three words.

Tina spelled all of the words with one letter. Similar to Mark, Tina confused the letters *b* and *p*. In addition, she would say one letter aloud and write a different letter. Her spellings frequently contained the letters, *h* and *j*. She represented the correct initial sound in three words.

Jack spelled all the words on the Taught list with 2-6 letter sequences. He made a real word substitution for one of the tested words. He correctly indicated the initial sound in three words and the ending sound in one word. Of these three, Jack received credit for two logical, initial sound substitutions. He was given credit for the *b* substitution in *p* since he often confused these letters when writing. He also received credit for his substitution *c* for *k* in the word, *kit*. Both of these substitutions are indicative of his emerging understandings of letter sounds and their representations.

The posttest results from the Untaught list are provided in Table 15.

Table 15

Results from Spelling of Words from Untaught Master List

	Posttest: Spelling of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
nap	st	D	H	**bn**ck
hill	**h**J	r	J	con
lick	SJ	O	**K**	**k**on
shell	**sh**	l	H	nyc**l**
pain	**p**h	**p**	T	rill
pest	Jr**e**s	R	H	see
bake	**B**JP	m	J	noet
fail	**l**J	n	J	dha
sank	**Kn**	**S**	**K**	hos
tame	mog	**T**	H	doy
dump	JKr	**D**	J	coa
tore	**or**	b	H	nae
lock	J**KL**	V	i	teb
pine	JKer	**P**	H	hat
luck	J**K**Er	D	P	tole
woke	**o**p	O	B	doeiy

Note. *Bold type represents credited sounds*.

On the Untaught list, Kate correctly wrote the initial sound of five words and the final sound of four words. She also received credit for the use of three vowel sounds. She was given credit for three vowel sounds due to the salient nature of the sounds and intention that she displayed when spelling the words. Kate represented the vowels in *pest*, *tore,* and *woke*. She would repeat the word multiple times and name aloud the sound she heard before writing it down. Through this process, she demonstrated that she was able to hear more of the sounds, but often wrote them down out of sequence when spelling the target word. For example, she wrote the word *lock* as *jkl*. At first, she wrote the letters, *jk*. After repeating the word aloud, she added the letter *l*.

Similar to his spellings on the Taught list, Mark wrote one letter to represent the spellings of the words. He correctly spelled the initial sound of five words. For example, he

spelled *pain* as *p* and *tame* as *T*. Mark made a transition from pretest to posttest in the manner in which he represented words. He longer used a series of letters, numbers, and symbols. Instead, he was focused on letters only, and had more success with understanding initial letter sounds.

Tina was able to indicate the correct final sound in two words, both of which contained the letter *k*. She correctly wrote *k* when spelling *lick* and *sank*. When pronouncing both of these words, the *k* is clearly the most salient sound. Tina no longer used the symbol resembling an upside down capital *L* in any of her spellings. However, she did have difficulty writing the *j* on one occasion when she wrote the letter in a mirror image. Within other words, she wrote the letter in the correct direction.

On the Untaught list, Jack spelled each word with 2-5 letters, and correctly indicated the final sound of two words. For example, he spelled the word, *lick*, as *kon*. He also made a logical final sound substitution of the letter *b* for *p* when he wrote *bnck* for *nap*. Both the *b* and *p* are produced in the same area of the mouth for speech production. In addition, he represented the initial sound in *nap*.

Results of Periodic Checks

Words were randomly selected from the Master Word List using a random number generator. All participants wrote the word, using a pencil, in their own spiral-bound notebook. If I was unclear as to what letter the participant wrote, clarification was requested. Words in the tables were recorded in the same manner as the participant wrote. A dash (-) indicates that data was not collected. Periodic checks of spelling were taken at the same time and rate as the periodic checks for reading. After periodic checks in reading and spelling were completed, a practice *Making Words* lesson occurred.

Pre-instruction. None of the participants was able to correctly spell any of the words. Table 16 contains the participants' spellings of words to be taught that occurred prior to instruction.

Table 16

Results from Periodic Checks: Spelling Words to be Taught Prior to Instruction

	Spelling of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
pack	v	**p**evevys	j**k**lo	he
tight	v	**t**vathewei2ai9t9	klor	hes
dot	**D**	. bee	.	hab
that	D	fatter	kLg	hah
tug	D	heDev	kl**g**	dah
bay	D	pev	Lgoll	h**b**h
kit	-	-	PRi	bah
top	-	-	LKL	hh**b**

Note. *Bold type represents credited sounds*.
-data not collected for these words.

Kate spelled the six words with either the letter *v* or *D*. Her level of distractibility was high. At this point, I attempted to reason with Kate about the importance of putting forth her best effort. Kate represented the word, *dot*, with the correct initial sound.

Mark began spelling words used for the periodic checks with a variety of letters, numbers, and symbols. He did begin his spellings of the words, *pack* and *tight*, with the correct initial sound. With each check, the number of letters and numbers decreased. While Mark appeared focused while spelling, he often had difficulty with maintaining attention to the task between words and during the practice lesson that occurred afterwards. As well, he engaged in a number of immature behaviors. For example, he would say the words, baby and diapers, aloud and giggle. It was often difficult to redirect him once this type of behavior started.

Tina would write three to five letters when asked to spell a word. When spelling a word, she would write down a few letters, and then repeat the word a few times before adding additional letters. Two words included the salient, final sound of the word. For example, she spelled the word, *tug*, as *klg*. For the word, *dot*, she literally drew a dot on the paper. Tina's behavioral problems were in the form of complaining that she was tired while rubbing her eyes and putting her head down. She repeatedly made a throat scratching noise throughout each session. Despite these behaviors, she still demonstrated a great deal of effort at every session. After spelling words on one particular day, Tina said, "I can't read."

Before the instruction, Jack often wrote the same letters, or variations of those letters, for the spelling of words. For example, he spelled *bah* for *kit*, *hhb* for *top*, *hah* for *that*, and *hab* for *dot*. He did represent the initial sound in his spelling of *bay* and appeared to substitute the *b* for *p* in the word, *top*. Jack had no behavioral problems and responded well to all directions.

Table 17 lists the results of the participants' spellings of words from the Untaught list before receiving instruction.

Table 17

Results from Periodic Checks: Spelling Untaught Words Prior to Instruction

	Spelling of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
pain	v	bveiatheiol5iauLhew	rldk	son
fail	v	pevevvi9i9tthe	kl6**l**	heb
sank	D	peew	gllo	dah
lick	D	pewe	ilop	vdne
pine	D	**p**ev	kLoll	dob
hill	**h**	i**h**ev	o**L**g	**h**eb
bake	-	-	**K**Lg	**P**e**K**
pest	-	-	ibi	ha**b**

Note. Bold type represents credited sounds.

Kate spelled each of the six words with one letter only: *v, d,* or *h*. She made few attempts to sound out words and was highly distracted. She did spell the word, *hill*, with the correct initial sound. For example, while writing a letter, she would ask questions, such as, "Is this hard?" After completing the periodic checks and practice lessons that occurred prior to instruction, I consulted with the teacher concerning Kate's lack of attention and frequent questions. The teacher confirmed that the behaviors were common for Kate, and suggested rewarding her good, daily work efforts with a band-aid.

Mark continued to use a variety of letters, numbers, and symbols. For example, *fail* was spelled as *pevevvi9i9the*. He spelled *pine* and *hill* with the correct initial sound (i.e., *pev* and *ihev*). After completing the checks, I consulted the teacher in order to better understand how to handle Mark's behavior issues. His teacher suggested that he receive the same reward for good work as what he received in class. So, when he was on task and focused during the lessons, I rewarded him with play money. Mark could use this money to purchase things in his classroom.

While Tina spelled *fail* with the correct final sound, the spelling also contained a number. Tina would repeat the target words approximately three times. Each time she repeated the word, *hill*, she added letters. She did indicate the final sound of *l*, but not in sequence. The same process occurred as she wrote *KLg* for *bake*. I discussed Tina's complaints of being tired with her teacher. While she did not having any classroom rewards in place, she suggested that Tina be rewarded with a small piece of candy. While I obliged, Tina seemed to respond equally well to positive praise and encouragement as much as the candy.

Jack spelled *hill* with the correct initial sound and indicated the salient *k* in his spelling of the word, *bake*. Again, when spelling a word that started with the letter, *b*, Jack wrote a *p* (*PeK* for *bake*) and writing the letter, *b*, for a word that started with the letter *p* (*hab* for *pest*). While Jack had no behavior problems, his teacher suggested a reward system like Mark's since they were in the same class. However, Jack seemed indifferent to the reward. He was quite motivated by the instruction alone and despite his difficulties with the tasks, he never quit or complained. Jack was always patient.

During instruction. While none of the participants was successful at spelling a word or rime, qualitative differences in the participants' spellings suggest progress in understanding that correct/incorrect spelling measures cannot detect. Table 18 contains the spellings that occurred during the *Making Words* instruction.

Table 18

Results from Periodic Checks: Spelling Taught Words During Instruction

	Spelling of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
that	**ht**	ore	ilk	dna
pack	**p**t	506	**p**lp**k**	da**k**
wheat	shp	**w**ed	sh	lna
pack	th	ded	**k**k	the
that	**t**oo	**t**ee	**th**pklpkl	ffeek
fin	**f**p	heepl	**f**shgrlpb	sioo**n**
tug	she**g**	kp	**g**	ena
that	ha**t**g	k**t**	k	kne
pack	**p**poh	lb	**k**	**b**an
tight	spof	**t**	J	kra

Note. *Bold type represents credited sounds*.

During instruction, Kate's attempts seemed to become more intentional. She spelled four words with the correct initial sound, and included more than one letter for all of the

words (e.g., *fp* for *fin*). She also wrote the correct final sound for three words (e.g., *tug* as *sheg*). She included the rime in her spelling of *that* when she wrote, *hatg*.

By the fourth week of instruction, Mark no longer included numbers or symbols in his spellings. He spelled *tight* with the correct initial sound, and was able to correctly indicate the first letter of a word containing a digraph as the initial sound (i.e., *wheat* for *wed*). He spelled *that* on both occasions with the correct final sound (i.e., *tee* and *kt*).

Throughout the instruction, Tina transitioned into a stage in which she often wrote one letter to represent the spelling of an entire word. More initial and final sounds began to appear in her spellings over time. She spelled the word, *that*, as *thpklpkl*, and the word, *fin*, as *fshgrlpb*. She represented the final sound in two spellings of *pack* (i.e., *kk* and *k*) and one spelling of *pack* contained the initial and final sound (i.e., *plpk*).

Jack began to indicate the salient, final sound in words. For example, he spelled *dak* for *pack* and *sioon* for *fin*. He used a greater variety of letters in his spellings than prior to instruction. He continued to substitute the *b* for the letter, *p*. For example, when spelling the word, *pack*, he wrote *ban*. When asked what letters he wrote, he stated that the first letter was *p*.

Spellings of the Untaught words revealed similar patterns found in the spellings of the Taught words. Table 19 provides each participants' attempts.

Table 19

Results from Periodic Checks: Spelling Untaught Words During Instruction

	Spelling of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
luck	pt	507	p**kl**o	han
shell	s	654	rpg	bea
lock	jlp	oi21	ii	fnn
dump	gh**p**	**p**ev	hh	chr
pest	**sp**	heveiva	hhghtlkbk	thenck
lock	joo	ei3a0119	**k**httehlkbp	ffee**k**
luck	ju**k**	**k**t	i	afh
tore	rhpp	k**t**	h	hta
pest	**sp**h	d	**t**	cah
tame	jkh	**t**	s	hce

Note. Bold type represents credited sounds.

While spellings before instruction contained one letter only, Kate seemed to gradually move toward spelling words with more letters during instruction. She spelled *luck* and *dump* with the correct final sound. While she did not have the letters in correct order, she spelled *pest* with the initial sound of *p* and included the salient sound of *s* in her two spellings of the word.

Mark spelled the correct initial sound in two words, though out of sequence in his spelling of *tore*. He spelled the correct final sound in the words, *dump* and *luck*. His transition away from numbers in his spellings was consistent within his spellings on the Untaught list as well as the Taught list.

Similar to the Taught list, Tina often wrote the salient, final sound first or toward the beginning of her spelling of the word (e.g., *khttehlkbp* as *lock*). She also indicated the correct initial sound in *luck*. With the exception of two words, Tina used one to four letters to spell each word.

Jack correctly indicated the salient, final sound when he wrote *ffeek* for *lock*. As with the Taught list, he used a greater variety of letters in his spellings. As well, he spelled all the words with three to six letters.

Post instruction. Periodic checks occurred at two-week intervals. The results for the patterns taught during instruction are provided in Table 20.

Table 20

Results from Periodic Checks: Spelling Taught Words Post Instruction

	Spelling of the Word from Taught Master List			
Target word	Kate	Mark	Tina	Jack
tight	J JK	D	h	bol
lip	s **p**ho	r	i	dno
top	ju	**t**uet	h	had
fin	ht	rin#	k	bea
pay	**p**t	**p**ehl	H	any
wheat	p**t**	**t**oha	J	nea

Note. *Bold type represents credited sounds*.
#indicates correct rime

Kate successfully spelled *pay* with the correct initial sound and *wheat* with the correct final sound. While she wrote the letters out of sequence, she spelled the final sound in *lip* (i.e., *s pho*).

Mark continued to use letters only to spell the words. Compared to pretest measures, he seemed to have a greater understanding of how to spell. He correctly spelled the rime, *-in*, when he wrote *rin* for the word, *fin*. He spelled the words, *top* and *pay*, with the correct initial sound (i.e., *tuet* and *pehl*), and *wheat* with the correct final sound (i.e., *toha*).

Tina spelled all the words with one letter only. She used four letters for all of her spellings (i.e., h, i, k, j). The letter, *h*, was used with the greatest frequency. Like Kate and Mark, she wrote the letters using a combination of upper and lower case letters.

Jack spelled all of the words with three letters. He wrote exclusively with lower case letters. Each spelling contained two consonants and one vowel. As well, he substituted two real words, *had* and *any*, for the target words, *top* and *pay*.

At post instruction, periodic checks on the participants' abilities to spell words from the Untaught list occurred at two, four, and six weeks following the completion of the instruction and are listed in Table 21.

Table 21

Results from Periodic Checks: Spelling Untaught Words Post Instruction

	Spelling of the Word from Untaught Master List			
Target word	Kate	Mark	Tina	Jack
luck	J J**K**	**k**	**k**	hob
pain	O **P**T	D	h	d**n**e
tame	h**t**	**t**ue	s	bny
pine	**p**th	dev	h	yha
pain	t**p**	dedey	h	d**n**e
shell	sp	red	j	yna

Note. *Bold type represents credited sounds*.

Kate was more successful at spelling the correct initial and final sounds on the Untaught list. She indicated the correct initial sound, though some were out of sequence, for *tame* and *pine (i.e., ht* and *pth)*. The word, *pain*, occurred twice and both times, she spelled the initial sound, initially as *O PT* and later as *tp*. She spelled *luck* with the correct final sound (i.e., *J JK*).

Mark spelled the word, *tame*, with the correct initial sound (i.e., *tue*) and the word, *luck*, with the correct final sound (i.e., *k*). None of his spellings contained more than five letters.

Similar to the Taught list, Tina spelled all the words from the Untaught list with one letter. The same four letters as found in the Taught spellings were used (i.e., k, h, s, and j).

The letter, *h*, was used with the greatest frequency. She indicated the correct final sound in *luck*. Again, the salient ending sound of *k* was repeated in her spelling of this word (i.e., *k*).

Jack continued his pattern of spelling the words with three letters. Though letters were out of sequence, he spelled *pain* identically both times as *dne* and with the correct final sound.

In sum, the performances of all four participants on the various spelling measures were similar in many ways to peers who are typically developing and learning to spell, who are at the partial-alphabetic phase. Each participant is making some connections to letters and sounds in the written words and in their pronunciation of the words. While there are inconsistencies between words, this is a common occurrence as children learn to negotiate the letters and sounds.

Results from the Transfer Step of Instruction

After completing the word-making and sorting steps of the instructional lessons, participants were asked to spell three words that contained the same rimes that occurred in the working-making and sorting steps, but were different words. A model of each rime was provided for the participant. For example, participants were asked to spell the words, *swam, Pam*, and *farm*, during the second instruction session. A model word with the *–am* rime and a model word with *-arm* were provided. To spell the requested words, participants first had to distinguish which model would help them. Feedback was provided for correct and incorrect responses ("Yes, you need to use *harm* to help you spell *farm*." Or, "Let's sound these out. *Farm*. *Ham*. Those two don't sound alike. Let's try the other pair. *Farm*. *Harm*. Yes, I think you need *harm* to help you spell *farm*."). After writing down the rime, the

participant was then asked to determine the onset needed to spell that word. Once an attempt was made, I then modeled the correct spelling and provided corrective feedback.

The words spelled correctly, indicated by correctly determining the rime *and* correctly writing the onset, were combined in Table 22. Credit was not given if the correct rime was determined, but the incorrect onset was written. As well, credit was not given if the correct onset was written but the incorrect rime was chosen initially. If none of the words were spelled correctly, a zero (0) was noted in the column. Any words spelled correctly were indicated within the columns.

Table 22

Results from Transfer Step

	Words Spelled Correctly			
Lesson number	Kate	Mark	Tina	Jack
1	jam	start	0	(absent)
2	Pam	0	Pam	0
3	0	0	0	0
4	0	0	0	0
5	hit fit	fit	0	hit
6	0	king	0	0
7	0	0	0	0
8	fit	0	0	0
9	0	0	0	0
10	bug	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	feel	0	feel
14	0	keep	0	0
15	heat	0	0	0
16	0	0	0	0
17	0	beach	beat	0
18	(absent)	boats flat	0	0
19	boats	0	0	0
20	0	0	0	0
21	Jay	Jay	Jay	Jay
22	0	0	(absent)	0
23	0	0	0	0
24	jail	0	jail	0

Participants rarely spelled more than one word correctly per lesson with the exceptions of Kate and Mark each during one lesson each. The participants' ability to generalize information about the rimes to spell words proved to be quite difficult throughout the instruction. However, a pattern of improvement could be seen in the raw scores of Mark, Tina, and Jack. Each participant was able to spell more words correctly in the last 12 lessons than in the first 12 lessons. Kate spelled one less word correctly in the last 12 lessons. This

trend of greater success in the latter half of the instruction is consistent with trends in the word-making and sorting steps.

During lesson 21, all four participants correctly spelled the word, *Jay*. During this transfer step, only one rime pattern, *-ay*, was spelled. Thus, participants actually had to produce only the correct initial consonant letter. Three of the participants spelled at least one word correctly in lesson five. Kate was able to spell two words correctly. During five separate lessons, two of the participants spelled at least one of the words correctly.

Given the familiarity of all four participants with some sight word instruction indicated in the record reviews and educational goals, the words spelled correctly were compared with the Edmark 1 list of the first 150 words taught. Six rimes and two words were found on the Edmark sight word list. However, Mark and Jack had not received instruction in any of the rimes or words during the school year of the study, and Tina was not receiving sight word instruction. Only Kate had the potential of having learned one of the words during the sight word instruction. It should be noted, however, that Edmark does not focus on spelling but only sight word instruction.

As a whole, the spelling measures seemed to capture changes in the developmental spelling abilities of each participant. Mark's pre- and posttests and periodic checks are most notable in progression. While he used a combination of up to 17 letters, numbers, and symbols at pretest to spell one word, his posttest measures consisted of one-letter spellings to represent words, with 15 of those having the correct initial or final sounds. Similar to Mark, Jack represented the words at pretest with up to 13 letters. His posttest spellings contained up to six letters and began to contain a similar number of letters to the target words.

Periodic checks prior to instruction were similar to pretest results. Kate spelled each word with one letter only, Mark with a series of letters, and Tina and Jack with three to six letter combinations. Periodic checks taken during and after instruction revealed that all four participants were similar, except for Mark. He began writing exclusively with letters and representing more initial consonant sounds.

Overall, the participants seldom spelled the words accurately in the transfer step of instruction. However, Mark, Tina, and Jack spelled more words correctly in the final 12 lessons than in the first 12 lessons of instruction. This suggests a greater familiarity with the task as well as the letter-sound correspondences.

Question 5

This question addressed the growth and development of phonemic awareness and orthographic knowledge through use of the QIWK spelling task. This task was the most sensitive to growth for the skills measured. The QIWK was scored by counting the number of correct phonemes in the correct position of the word and is indicated on the table in bold type. For example, Mark spelled *bump* as *B*, thus correctly indicated the beginning sound in the word with the correct letter. Pretest and posttest results are presented below in table 23.

> Question 5: What are the effects of a spelling-based phonics instruction strategy on the ability to indicate growth and development of phonemic awareness and orthographic knowledge?

Table 23

Pretest and Posttest QIWK Results

	Spelling of the Word							
	Kate		Mark		Tina		Jack	
Target word	Pre	Post	Pre	Post	Pre	Post	Pre	Post
trap	D	**pt**	HoKicike	**P**	**T**e	H	dah	kne
bed	**b**er	bed*	theithew	**D**	**D**r	**D**	eia	**b**ey
when	**n**	**w**e	Biathiaia71	D	**h**o	J	tha	toy
wish	n	**w**atk	otheweweii	D	**S**H	H	aie	io
sister	**s**	**s**tt	**s**thewvay	**R**	**S**H	H	dna	nok
girl	**g**	**g**nn	oyathisul	b	J**R**	J	the	tos
drop	**p**oo	kt	biatthaia	K	gi	**P**	-	she
bump	**b**	kt**p**	atheippia	**B**	A	K	-	see
drive	**D**	**D**v**e**	Hoyiatthew	O	**J**	B	-	bna
plane	**a**	**a**y	fiattheip	**P**	or	C	-	hicl
ship	**sp**	**p**jnr	Hatthew	b	ll	H	-	fo
bike	**b**oo	**B**J	Kewewi:	D	**K**	O	-	ohe

Note. *Bold type represents credited sounds*.
*word read correctly

Kate demonstrated an increase of five phonemes. For example, at pretest she spelled *bed* as *ber*, indicating correct initial letter. At posttest, she correctly spelled the word. Though the phonemes were reversed, she correctly indicated beginning and ending sounds in the word, *trap*, when she wrote *pt*, whereas at pretest she received no credit for phoneme representation when she spelled *trap* as *D*.

Mark demonstrated an increase of five phonemes as well. Mark's pretest results indicated a pre-alphabetic stage of spelling (Ehri, 1998). He understood that letters and letter-like representations were necessary for the task but he had difficulty being strategic with his choices. For example, when asked to spell *bump*, he wrote *atheippia*. At posttest, he correctly indicated the initial sound of the word when he wrote *B*, demonstrating that through the instructional experience, he seems to have moved from the pre-alphabetic phase

to the partial alphabetic phase (Ehri, 1998). Another example is his spelling of the word, *bed*. At pretest, he wrote *theithew*. At posttest, he wrote *D*, indicating the correct ending sound.

Tina and Jack had more difficulty. Tina represented six fewer phonemes at posttest. For example, she correctly indicated the ending sound for *bed* when she spelled the word, *D*. She spelled all of the words with one letter only, and used the letter, *h*, with the greatest frequency.

Jack only completed half of the spelling task at pretest because he became too frustrated to continue. At posttest, he completed the list in its entirety. While he only represented one phoneme correctly at posttest, qualitative differences are evident. One such demonstration is his inclusion of three real words in his spellings. For example, he spelled *see* for *drop*. Jack spelled with a greater variety of letters at posttest than at pretest. With the increase in the number of real words, it seems as though Jack is relying heavily on visual strategies for recalling words. In other words, he has memorized the word, either during instruction or within his environment, and is writing this familiar word when asked to spell an unfamiliar word.

In sum, the QIWK seemed to capture the participants' understanding of phonemic awareness and orthographic knowledge. Both Kate and Mark demonstrated an increase of five phonemes from pretest to posttest. Jack, who was unable to complete the pretest, attempted all of the words in posttest, represented one phoneme correctly, and included real words within his spelling attempts. Kate's progress may partially be attributed to reading group instruction and periodic tutoring with her after school worker. Mark's spellings demonstrated a change in developmental stages during the instruction. Tina's posttest scores

on the QIWK declined from pretest. This may be attributed partially to the posttest being administered during the final week of school.

Question 6

This question examined the ability of the participants to segment words into parts using a set of colored blocks to represent the sounds in words spoken. This task proved to be challenging for all of the participants.

Question 6: What are the effects of a spelling-based phonics instruction strategy on the ability of children with Down syndrome to segment words?

The segmentation task revealed no differences for Mark and Jack. Kate segmented one fewer word, and Tina segmented three fewer words at posttest. All four participants seemed to have a great deal of difficulty understanding the task. I stopped and repeated the instructions multiple times for all the participants at pretest and posttest. Kate, Mark, and Jack would frequently name letters, which may or may not have been within the words, rather than the sounds in the words. Tina segmented two words by onset and rime at pretest. At posttest, she named letters. In sum, results from this measure did not capture changes in participant performance.

All four participants were unable to demonstrate an understanding of how to segment words into sounds. This may have been related to their limited experience with word instruction or the abstract nature of the task. None of the four participants were able to successfully segment words into sounds. This task may have required background understanding that could not be attained by the practice examples demonstrated prior to the task. In addition, the task required participants to represent their understanding of phonemes within spoken words by manipulating colored blocks.

Question 7

This question examined the participants' ability to use a limited set of letters to engage in guided invented spelling and was examined in the students' daily progression in the word-making step of the instruction. Of the three steps, the most promising growth was revealed in the word-making step of the instruction strategy. During each lesson, participants were given a limited set of letters and asked to spell a minimum of eight words and a maximum of 11words per lesson. The words built on one another (i.e., the participant initially might have been asked to take three letters and spell the word *cat*). Most of the time, the next word spelled would have required changing one letter, such as the *t*, and adding a letter to spell the word, *cap*.

> Question 7: What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to use a limited set of letters to engage in word-making?

I reviewed and coded each videotaped lesson. The participants' responses during the word-making step of the instruction were analyzed and coded into three categories: correct with first attempt, correct with cue, or model provided.

In order for the response to be coded as *correct with first attempt*, the participant had to correctly spell the word using the given set of letters without any assistance.

A code of *correct with cue* meant that the participant had to receive help from me in order to spell the word correctly on a second attempt. One example of this occurred during lesson 4 for Jack. He was asked to use two letters to spell the word, *is*. He used the letters, *ist*. I responded by saying, "Remember, I asked you to use two letters to spell *is* and you

have three letters that spell *ist*. Can you use two letters to spell *is*?" Jack responded by removing the letter *t* and correctly spelling *is*.

A code of *model provided* indicated that the participant attempted the word first, received a cue, and was still unsuccessful in correctly spelling the word. At this point, I provided a model of the word printed on an index card, and the participant was asked to "make your word look like mine."

Trend lines for each participant in the graphs below indicated positive slopes. Each trend line was determined by using the split-middle method (Tawney & Gast, 1984). The four steps of the split-middle method involved: (a) dividing the data into halves and drawing a vertical line through the middle data point, (b) finding the intersection of the mid-data point, (c) drawing a line through the data passing through both intersections, and (d) counting to see if the number of data points below the line is the same as the number of data points above the line. Across lessons, all participants except Kate made increasingly more accurate first attempts at spelling the words during the making words step. Each participants' results are reported separately in Figures 1-4.

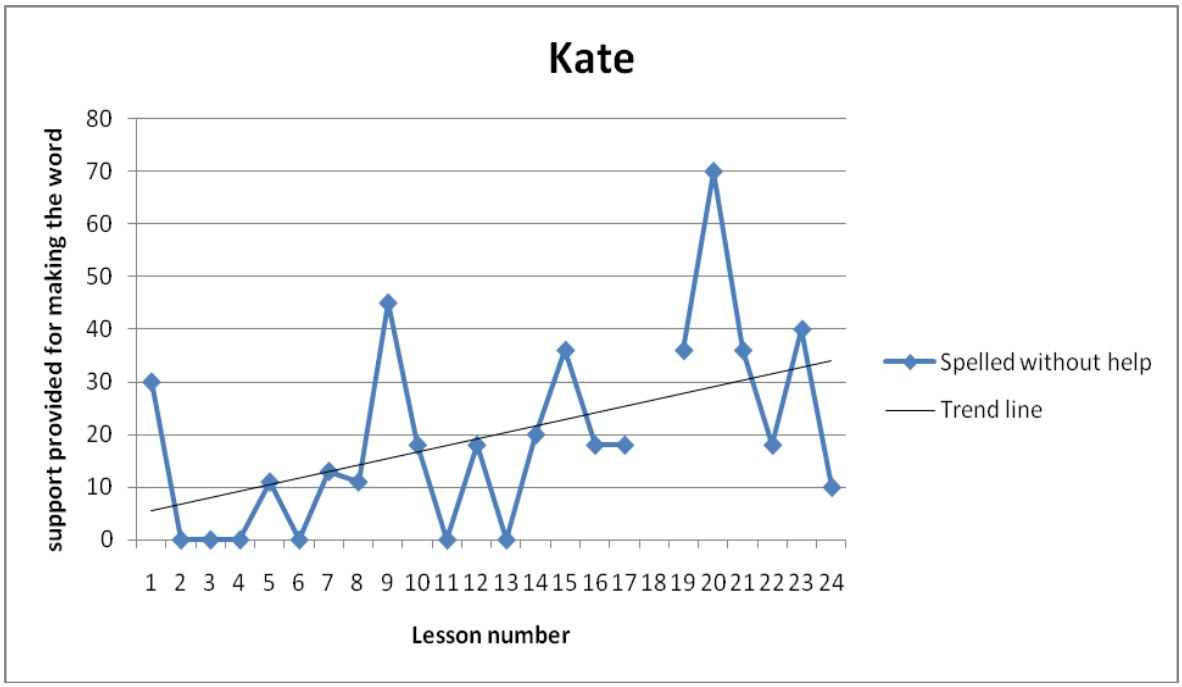


Figure 1: Kate's ability to spell words during the word-making step without help over the course of 24 lessons.

As seen in Figure 1, Kate had six lessons where she was unable to spell any of the words correctly with her first attempts. Five of these occured during the first 12 lessons of instruction. She experienced greater success in the last 12 instructional lessons. At lesson 20, she spelled 70% of the words correctly on her first attempt. A break in the graph at lesson 18 indicated that Kate was absent from school on that day.

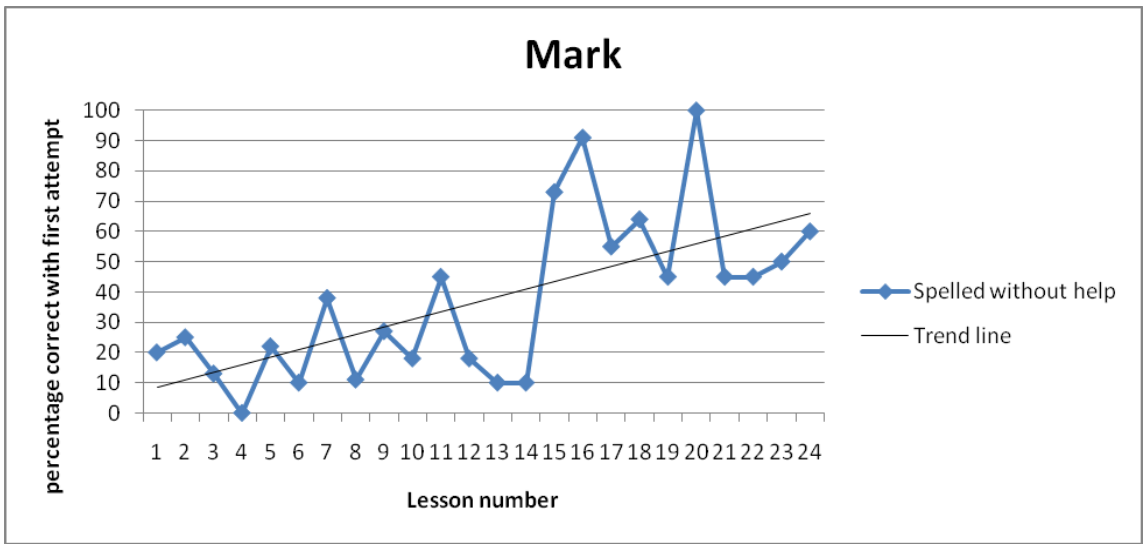


Figure 2: Mark's ability to spell words during the word-making step without help over the course of 24 lessons.

Mark did not miss any days. On lesson four, he was unable to spell any of the words correctly on first attempt. He continued to have limited success with first attempts for the first 12 lessons. However, his rate his of success improved considerably from lesson 15 to lesson 24. His highest rate of success occurred at lesson 20 when he spelled all of the words correctly with his first attempt. Mark often chose the correct letters to spell the word, but was unable to put the letters in the correct sequence. He was very excited each time that he successfully spelled a word, and would often celebrate by saying, "Go, Mark! Woo hoo!" After celebrating, he had some difficulty returning to the task. He continued to have behavioral difficulties throughout the lessons. If he did not spell a word correctly the first time, he became upset. This anger and frustration often built throughout lessons. However, he completed all the lessons and the reminder of the reward helped him.

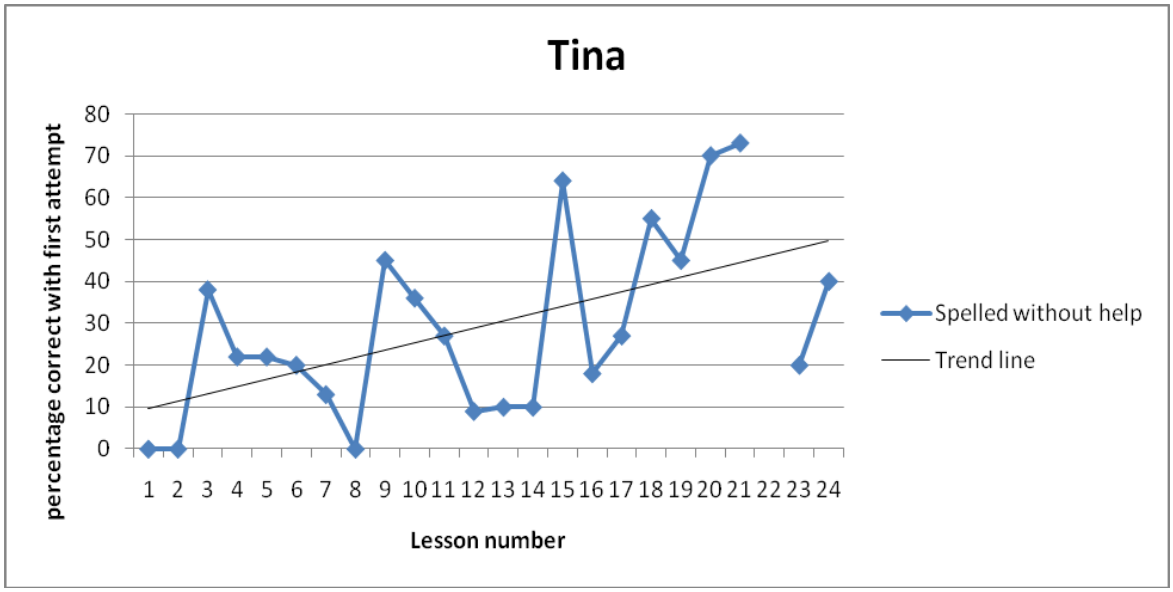


Figure 3: Tina's ability to spell words during the word-making step without help over the course of 24 lessons.

Tina seemed to have some success in the first 12 lessons. She was able to spell as many as 50% of the words correctly on one lesson. However, she was unable to spell any words correctly on the first attempt during three lessons. At least half of her lessons overall fell within a range of 10-30% accuracy. Her greatest levels of success occurred at lessons 20 and 21, where she spelled at least 70% of the words correctly. Tina was absent on lesson 22.

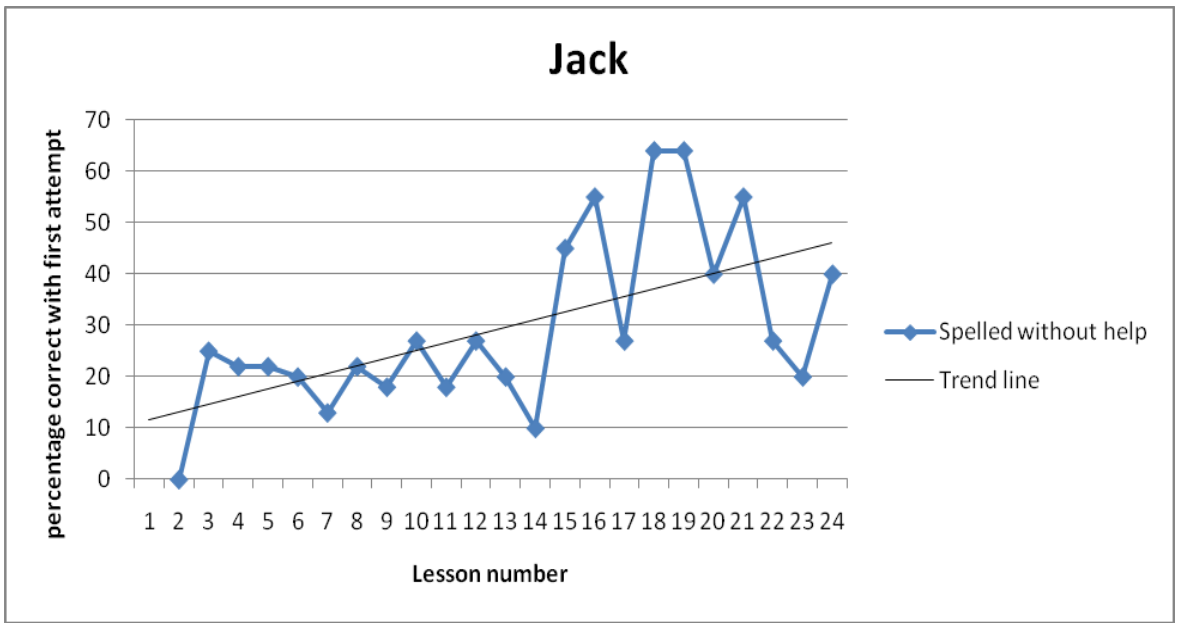


Figure 4: Jack's ability to spell words during the word-making step without help over the course of 24 lessons.

Jack was absent on lesson 1. His first 12 lessons were rather consistent, with 10-30% acccuracy on his first attempts. The latter half of the lessons demonstrated greater success. On two lessons, he was able to spell over 60% of the words correctly. Lesson 2 was the only time when Jack was unable to spell any words correctly on first attempt.

Overall, daily counts of the number of words spelled correctly without help indicated a trend of greater accuracy as the participants gained experience with the strategy. This seemed to imply that the participants understood the strategy. While data per lesson indicated a wide range of variance, trend lines for all four participants were positive.

Question 8

This question was addressed by examining the participants' performance on the sorting step of the instruction. During this step of the instruction, the participants were provided with individual index cards that contained all of the words from the word-making

step. I chose a word and asked the participant to find a word that rhymed, or "sounded like," that word.

Question 8: What are the effects of a spelling-based phonics instruction strategy on the ability of children with DS to identify rime patterns within a limited set of words?

If the participant correctly chose a rhyming word, I confirmed the choice and emphasized the rime of the words. For example, Kate was asked to find a word that rhymed with *rat*. Once she chose *mat*, I responded with comments similar to the following: "Yes, Kate. You're right. *Rat* and *mat* both rhyme. See how both words contain the *–at* ending? *Rat*. *Mat*."

If the word did not rhyme, I would read the two words selected by the participant and then explain why the words did not rhyme. For example, Kate chose the word *at* when asked to find a word that rhymed or sounded like *am*. I responded with comments similar to the following: "You chose the word *at*. *At*. *Am*. Those two words don't sound alike. And look. The two words have different endings. Let's search for a word that rhymes with *at*. It should have a similar ending as well." The participants were asked to sort words with 2-4 different patterns per lesson. Not including the header word, each lesson contained a range of 2-7 total words during this sorting step.

Similar to the word-making step, I analyzed each sorting step of the lesson and used a four-stage coding system to indicate how the words were sorted: correct without help, correct with 1-2 cues, correct with 3-5 cues, and help provided. The help provided included words that the participant took over 6 cues to find and thus, required help from me. A trend line for each graph was drawn in the same manner described in Question 7. While all four participants demonstrated a positive slope, indicating more words sorted correctly without

help over time, Kate showed the least growth with this step of the instruction. As with the previous graphs, any breaks in the lines indicate the participant was absent from school. Each participants' results are reported in Figures 5-8.

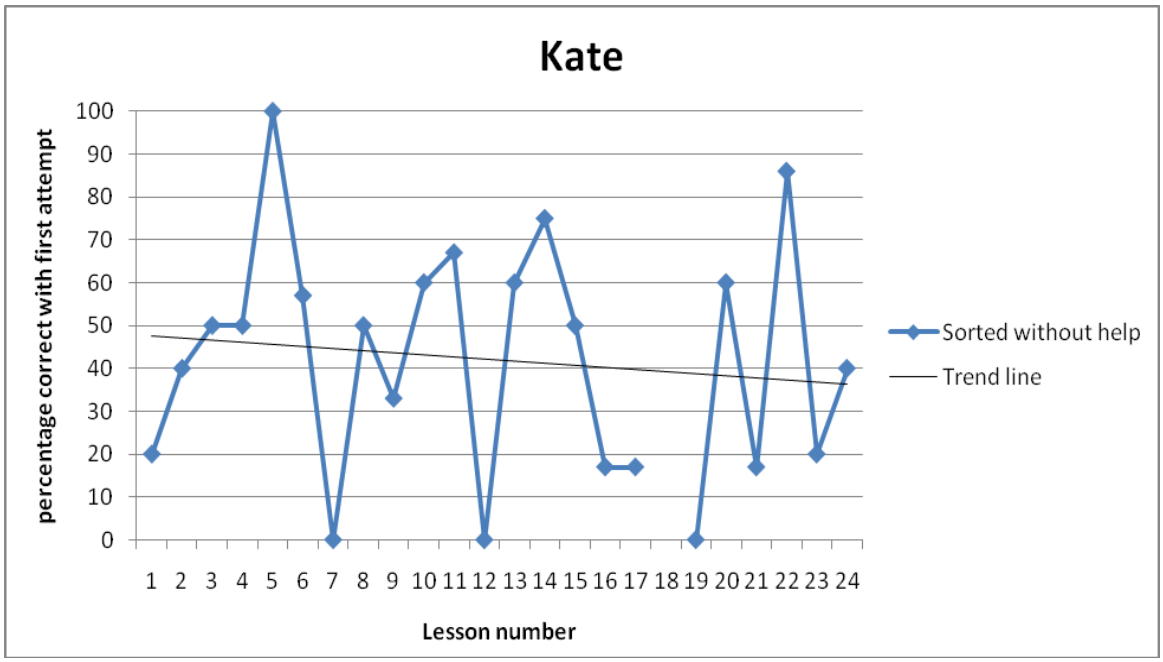


Figure 5: Kate's ability to sort words during the sorting step without help over the course of 24 lessons.

This step proved to be difficult for Kate. During three lessons, she was unable to sort any words correctly. She achieved the greatest success at lesson five when she sorted all the words correctly. Her initial attempts with sorting often consisted of a focus on the intial letter of the word only. Despite repeated instruction on how to sort the words, she continued to struggle throughout this step. She required frequent reminders of her reward in order to complete this part of the lesson.

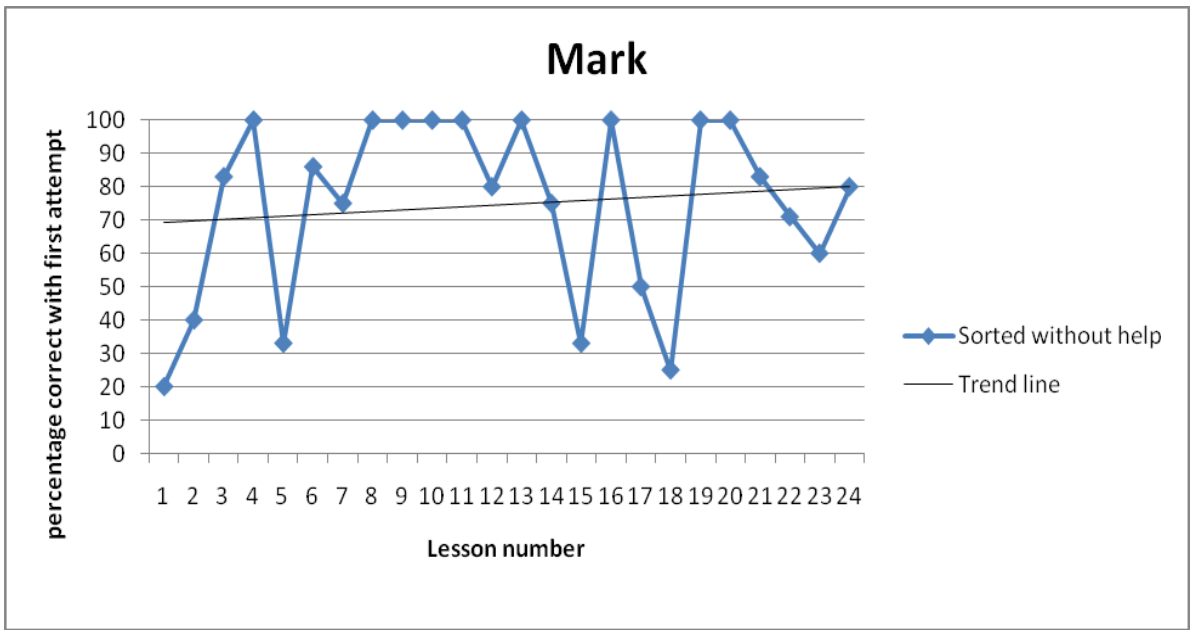


Figure 6: Mark's ability to sort words during the sorting step without help over the course of 24 lessons.

Once Mark understood the process of sorting, he was quite successful. By lesson 11, Mark discovered a strategy to help him with the sorting step. He covered up the initial letter or letters with his fingers so that he could focus on the rime itself. While other participants had to be shown how to do this, Mark developed this strategy independently. Mark sorted all of the words correctly on his first attempt in nine lessons.

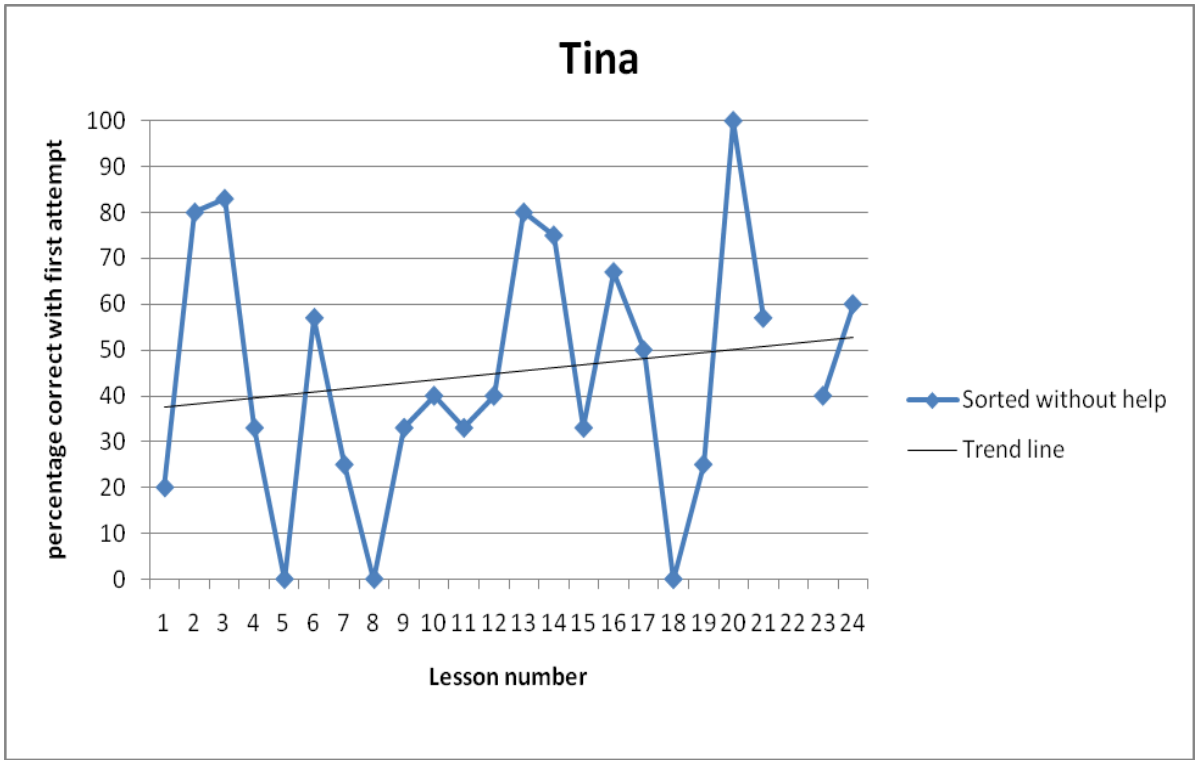


Figure 7: Tina's ability to sort words during the sorting step without help over the course of 24 lessons.

By lesson 9, Tina reached a better understanding of how to sort the words. After demonstrating how to cover up the beginning letters, she was more successful. In previous lessons, she focused on the beginning letter. Tina did not use this strategy during each lesson. She often chose words during the sort that had the same letters as the rime, but in a different order. For example, when asked to find a word that rhymed or sounded like *oats*, she chose the word, *coast* and pointed at the *o* and *a* in the word.

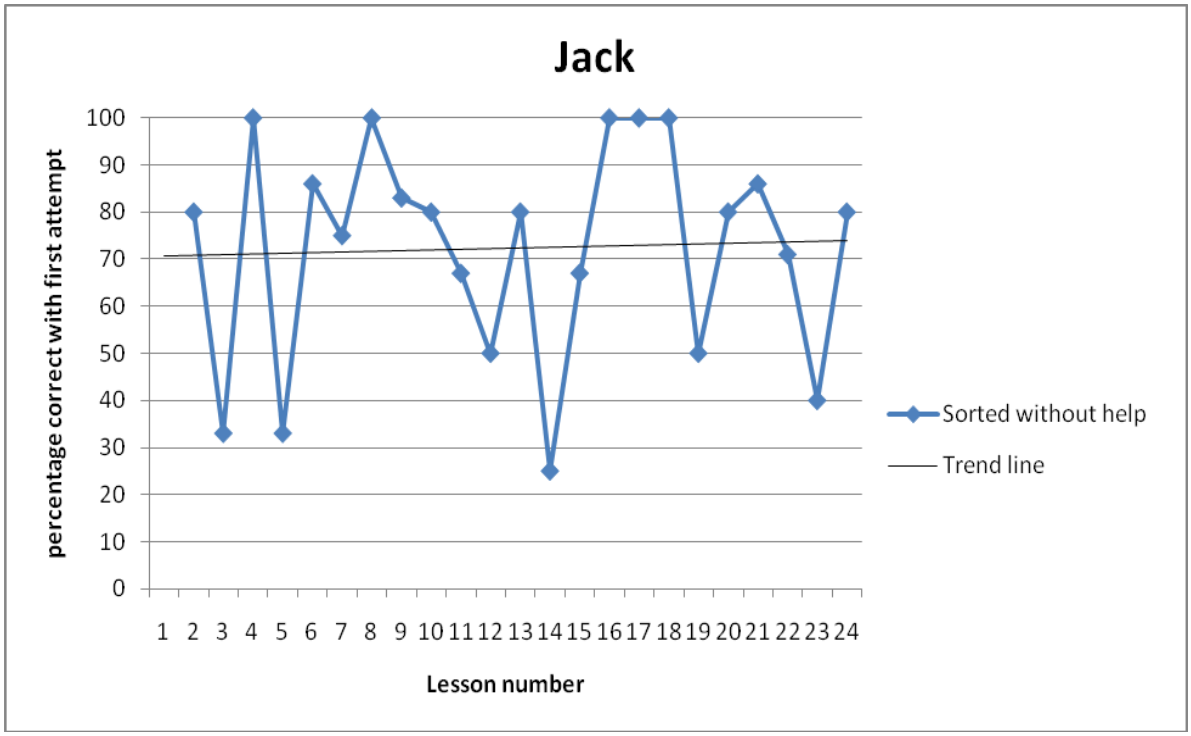


Figure 8: Jack's ability to sort words during the sorting step without help over the course of 24 lessons.

Jack had varied success with the sorting step. He sorted all the words without help during five lessons. Similar to the other participants, Jack looked at the word and found a word that was visually similar. For example, when asked to find a word that rhymed or sounded like *cat*, Jack chose the word, *cot*. For the word *coast*, he chose the word, *cast*. He freqeuntly needed to be reminded of the strategy of covering up the initial letter or letters frequently.

All participants except Kate demonstrated a positive trend line for the sorting step of the instruction. Mark successfully sorted all of the words in the lesson on nine occasions while Jack did so on five occasions. While Tina was only able to sort all the words correctly in one lesson, her trend line showed steady growth throughout the instruction. While Kate also sorted all the words correctly in one lesson, her performance was more variable

throughout the instruction, and her trend line revealed a negative slope. Her difficulties seemed to be related to two factors. First, she had been trained to expect a reward for every good behavior, and consequently, focused more on the reward than the learning activity. Second, she continued to attend to the onsets in words rather than the rimes.

Summary

Four participants in a self-contained school located in a rural school district of western North Carolina engaged in word instruction for a period of six weeks. Measures included pre- and posttests, periodic checks, and lesson performance data. Pre- and posttest measures were least sensitive to capturing changes in participant performance. Qualitative analysis of the periodic checks and data generated from the lessons provided a clearer representation of participant performance. A number of possible explanations are explored in the next chapter, which seeks to interpret the performance of each participant.

Chapter 5

DISCUSSION

This study investigated the effects of providing a spelling-based phonics approach to word instruction for children with DS. Four participants, ages 16-20 years, received a total of 9-10 hours of instruction. The findings in this study help provide a better understanding of the issues surrounding the teaching of phonics to children with DS. *Making Words*, a strategy that originates from regular education (Cunningham & Hall, 1994), was investigated as one possible method for providing this word instruction.

Capturing Student Reading Growth

Several tests were administered in an attempt to capture growth in the participants' ability to read words, particularly words containing high frequency rimes. Data were collected in a number of ways: pre- and posttests, periodic checks, and daily measures. Two pre- and posttests, the QRI Word Recognition Assessment and the Z Test, resulted in quantitative scores. For the participants in this study, these tests did not indicate measureable reading growth. The Taught and Untaught Master Lists were administered at pre- and posttest, and words were selected from the lists for the periodic checks. While little growth was captured by quantitative measures, qualitative differences were evident in student performance. These are described below.

QRI Word Recognition Assessment

Measures of the ability to read words with high frequency rime patterns that were taught in the instruction, as well as high frequency rime patterns that were not taught, were

examined through pre- and posttests and periodic checks. The QRI word recognition assessment seemed to indicate some growth for Kate. However, Kate had the broadest background in reading of the four participants. She received sight word and guided reading instruction twice a week at school. Her progression in the sight word instruction far surpassed that of the other participants. In addition, her after-school aide, a mother of an adult child with a significant disability, often helped her with learning sight words. While her growth does not compare to peers who are typically developing, Kate's background with words and literacy instruction is still more extensive than that of the other three participants and may have influenced her test results.

Mark, Tina, and Jack's scores on the QRI indicated little change. Mark and Jack were both in a sight word instruction group that received instruction approximately twice a week. While Tina displayed an interest in learning words, she received no word instruction with her teacher. She spent half of the school day at a work placement site. She returned to the school for lunch and enrichment classes. Remaining time in the school day was spent completing worksheets independently. These three participants received less reading instruction at school than Kate and no supplemental instruction after school. Their limited literacy background, particularly with letters, sounds, and words, influenced not only their ability to benefit from this instructional approach.

Z Test

The Z Test provided limited information about the decoding abilities of Mark, Tina, and Jack. While Jack was able to read one word at posttest, this may have been due to chance and his preferred test-taking strategy. He often provided a nonsense or real word that began with the letter z, and repeated it for four to five words. Mark's performance on this

task became more intentional at posttest. During pretest, he pronounced all of the words on this measure as *zut*, with the exception of one word. By posttest, he made at least 13 unique attempts. While Tina's responses varied, she was unsuccessful at reading any of the words. Kate proved to be the most strategic with her responses. She often would name another word with the rime. For example, when asked to read the word, *zore*, she read *store*. The abstract nature of the task, decoding nonwords, may have been part of the issue for the participants in this study. Cunningham et al. (1999) administered the Z Test to first and second graders, who had significantly greater reading experience than the participants in this study. Students in the Cunningham et al. study received reading instruction in a literature-based basal series, and many of the teachers incorporated self-selected reading, daily writing, and word wall use.

Cunningham et al. (1999) concluded that decoding nonwords seemed to require an ability that decoding real words did not and suggested that real words would provide a better estimate of a student's ability to decode. When working with children with intellectual disabilities, it may be more beneficial to use measures, as well as instruction, that use real words, and thus, eliminate the abstraction and difficulty introduced by nonwords.

Taught and Untaught Master Lists

Like the results of the QRI word recognition assessment and the Z Test, reading words on the Taught and Untaught Master Lists revealed little evidence of growth. The limited duration of the study may provide one possible explanation for these results. While all participants received a total of 23-24 lessons, each had to become acquainted with the (a) instructional strategy, (b) demands from me, and (c) behavioral requirements of the lessons. The *Making Words* lessons used in this study were designed for a classroom of first grade children who are predominantly typically developing. As such, the children are receiving

this instruction within a framework of established classroom expectations and learn the strategy in a whole class setting with their peers. Each participant in this study had to become familiar with a new instructor, who in turn, had to learn strategies for coping with their unique behavioral issues. As well, the strategy required modification for not only a one-on-one setting but also for the language used during instruction of the students. For example, I had to clarify or eliminate the use of instructional language, such as "first letter," in order to overcome a lack of understanding of the term, *first*.

An alternative explanation could be related to the past experiences of the participants. Each of the participants had limited experiences with literacy instruction and had seldom participated in intensive, individualized, and academic instruction. For example, Mark and Jack received sight word instruction a few times a week as members of a group of three students. Their responses during this instruction occurred in a round-robin style, where one student provided a one-word response, and then the next student provided a one-word response, and so on. The sight word instruction found in the participants' classrooms is consistent with Conners' (1992) conclusion almost a decade ago that sight word instruction remains prominent in special education classrooms. Observation and informal discussion revealed that literacy was not a focus of the school either currently or historically. The principal of the school discussed the lack of academic focus as well as the limited funds for materials and the absence of a budget for library acquisitions. Some of the classrooms had no books, word walls, or alphabet displayed.

An additional explanation for the limited evidence of growth on these measures may be related to the requisite knowledge for the strategy used in this study. A model of reading development proposed by Morris, Bloodgood, Lomax, and Perney (2003) suggests that

beginning consonant awareness may be facilitated by alphabet knowledge. From this point, concept of word and spelling words with beginning and ending sounds seems to develop; phoneme segmentation, word recognition, and contextual reading follow. While all participants had some degree of alphabet knowledge and letter-sound knowledge (i.e., beginning consonant awareness), none had the full range of letters and sounds that Cunningham and Hall (2009) considered necessary prior to implementing this instructional program. Three of the four participants could identify most of the tested alphabet letters; all four participants knew about half or fewer of the tested letter-sounds. While each of the participants demonstrated qualitative differences in their understanding of letter-sound relationships and spelling, they were unable to demonstrate progress across quantitative measures.

Unlike the information gathered from the other two tests, reading of the words on the Taught and Untaught Master lists and the periodic checks could be qualitatively analyzed. This analysis yielded more specific information about the participants' progression in ability to read words with high frequency word patterns, both taught and untaught. One example is the qualitative analysis of the periodic checks. The checks were time-efficient methods for gathering information on their abilities. These checks also proved insightful when examining change over time. A raw score of zero words reveals little about Mark. However, a closer look at his pronunciations during instruction and post-instruction demonstrated that he was paying more attention to the first letter of each of the words and making reasonable attempts that more frequently utilized the beginning letter sound. His attempts prior to instruction seemed to reveal less strategy. These attempts included stating the name of the first letter, stating a nonword, and substituting a real word that sometimes contained the same beginning

letter sound. While researchers have questioned whether the *reading* of words develops in sequential stages, as often seen in spelling, or whether the ability to sound out the letters and form a word is informed by the child's phonological awareness (Stuart & Coltheart, 1988), the participants in this study demonstrated qualitative changes in the manner in which words were sounded out. Examples of these changes include Mark's reading of the word *chat* as *cat*, and Kate's reading of the word *wheat* as won't. While neither Mark nor Kate read the word correctly, their attempts demonstrate a greater attention to the word in its entirety rather than only the first letter since correct initial and final sounds are represented in their pronunciations.

Sight Word Instruction

Sight word instruction historically has been the predominant method for word instruction for children with intellectual disabilities, and particularly, DS. Several studies have examined the merits of this approach with children with intellectual disabilities, and particularly DS (Browder & Lalli, 1991; Browder & Xin, 1998). Critics of traditional sight word instruction draw on the fact that it does not teach letter and sounds in words but rather the memorization of a bank of topically unrelated words. Further, sight word instruction alone will not lead to independent reading ability (van Bysterveldt, Gillon, & Moran, 2006).

The special education records of all four participants revealed a history of sight word instruction for each of the participants. At the time of the study, three of the four participants were receiving Edmark (Edmark Reading Program, 1972) sight word instruction while the fourth participant engaged in a computerized version. Given the screening results of these four high school-aged participants, and the many years they have received this sight word instruction, it appears that this approach has not provided the knowledge base needed to

accurately read pre-primer words. Three of the participants, Kate, Mark, and Tina, knew most of the letters used for screening, but could only identify half or fewer of the letter sounds. While children, who are typically developing, may be taught to memorize some words, such as *is* and *the*, the number of words taught in this fashion is small. Kate had the greatest sight word vocabulary and had completed many more lessons in the sight word instruction approach than Mark, Tina, or Jack. Learning letters and sounds is a critical skill for reading and spelling words independently. The data from this study suggests that the participants had little phonics knowledge at the beginning of the study but seem capable of learning phonics if the instruction is more appropriately matched to their current level of understanding of letters and sounds.

Spelling Words with High Frequency Rime Patterns

All four participants demonstrated qualitative advances in their spelling abilities. Based on the pre- and posttest measures, periodic checks, and the data generated from the transfer step of the lessons, the participants' spellings seem to demonstrate increased understanding of how letters and sounds work within words. When asked to spell words on the Taught and Untaught Master List prior to instruction, Mark did so by using a combination of letters, numbers, and symbols to spell each word, while Kate used only one letter per word. By post instruction, Mark spelled using only letters and Kate spelled with two to four letters and wrote the correct first initial or final sound for three words on the Taught list and five words on the Untaught list.

Growth in phonemic awareness and orthographic knowledge was also evident on the QIWK. Both Kate and Mark represented five more phonemes in their spellings at posttest. For example, Kate represented one phoneme in her spelling of *drive* as *D* at pretest. At

posttest, she represented two phonemes when she spelled the same word as *Dve*. Mark represented no phonemes correctly in his spelling of *bump* as atheippia . By posttest, he represented one phoneme correctly when he wrote *B*.

Similar patterns of development were found in some of the participants in the periodic checks. Mark and Jack frequently wrote three to four letters to represent the target word. During instruction and afterward, their spellings began to contain initial and final sounds. For example, Mark spelled *that* as *tee*, representing the initial sound correctly, and *dump* as *pev*, representing the final sound correctly. Jack spelled *lock* as *ffeek*, and *fin* as *sioon*, representing the final sound correctly in both attempts. These examples are indicative of greater attention to the letter-sound relationships in words that is necessary in order to move toward conventional spelling.

Taking into account the work of Henderson (1990), Stuart and Coltheart (1988), and others, Ehri (1998) suggests four phases of word recognition development: pre-alphabetic, partial alphabetic, full alphabetic, and the consolidated alphabetic phase. During the pre-alphabetic stage, children use visual cues to remember a word by its visual aspects. For example, the word, *pig*, may be remembered because of the tail of a pig looks like the letter *g*. However, children at this level have difficulty reading other words ending in the letter, *g*, since this strategy is not based on the sounds represented by letters. At the partial alphabetic phase, children read words by sight through connections they begin making between some of the alphabet letters in a word and the sounds they hear when pronouncing the word. The first and last letters, representing the most salient sounds, are used to support pronunciations and spellings at this stage. As well, some letter-sound correspondences are understood.

As children progress into the full alphabetic phase, letters and sounds are fully understood, and an understanding of how graphemes (i.e., letters) represent phonemes (i.e., units of sound) has formed. For example, children no longer mistake *big* for *pig*. As the consolidated alphabetic phase forms, children begin to recognize chunks, or rimes, in words. For example, the *–ick* may be remembered from the words, *sick* and *tick*, in order to help a child read an unfamiliar word, such as *pick*. This phase represents a more efficient way to read words as children encounter polysyllabic words.

While three of the participants began and ended the study in the partial alphabetic stage, Kate and Mark seemed to be particularly well grounded in their understanding. Both were more likely to represent beginning and/or ending letter sounds in the words than Tina or Jack. Over the course of the instruction, the fourth participant, Mark, seemed to move from the pre-alphabetic stage into the partial alphabetic stage. By the completion of the study, he no longer represented words through a series of letters, numbers, and symbols, but instead employed beginning and ending letter-sounds.

Segmenting Words

One component of phonological awareness is the ability to segment words into individual sounds. While previous researchers (see Cupples & Iacono, 2000, 2002) have successfully administered the segmentation task employed in this study, results from this study were inconclusive. Two participants showed decreases from pre- to posttest performance, while the other two showed no differences in performance. There is a level of abstraction associated with this sort of segmentation task. Students are asked to listen to a word and choose colored blocks that represent each sound. While this task does not mimic behaviors that are usually associated with reading, it has been used to demonstrate growth in

children with DS. In their study, Cupples and Iacono (2002), examined segmentation skills with children who (a) were mainly placed in regular education classes, (b) received reading instruction for an average of three years (range = 0 - 6.7 years), and (c) had been exposed to sight word and phonics instruction. The participants in this study lacked all of these opportunities. As well, since they were all operating at pre- and partial alphabetic understandings of words, the participants in this study did not have the requisite knowledge to be successful with this test.

Letters to Words

Based on daily measures, the percentage of correct word-making attempts revealed positive trends for all four participants. The data revealed that participants were generally experiencing more success with correctly spelling the words on their first try. This suggests that the participants were learning the *Making Words* strategy and engaged in the lesson activities. As the participants sorted the words, all but one participant required fewer cues from me over time and sorted words more successfully and independently. Again, the participants demonstrated increased understanding of the task and overall improvement in ability to sort the words correctly by visually identifying the rimes of the words.

The data from this study suggest that children with DS learned the steps of the instructional strategy, but were unable to demonstrate growth because the lessons were better geared to students at the consolidated or full alphabetic stages. The participants did, however, demonstrate progress in various ways (e.g., spelling more accurately in posttest measures and daily measures of word-making and sorting success). Increasing the number of words used in the sorting and transfer steps might provide more practice with spelling the rimes within each lesson. However, the greater need for the participants in this study lies in

providing instruction with a greater emphasis on letters and sounds, particularly at the onset level.

Making Words represents a spelling-based phonics approach that has been studied with children who are typically developing, but this study represents the first attempt at examining the effects of the approach with children with DS. When examining the trend lines for word-making and sorting, it is evident from the positive slopes that all four participants learned the instructional strategy. In addition, the lesson time decreased across all four participants suggesting a greater understanding of the tasks and a decreased need for explanation from me. A way to provide increased learning success would be to increase the number of words in the word-making and sorting steps of the strategy while focusing the instruction more closely at the developmental spelling level of the participants.

Despite growth and trends revealed in the data, the instruction appeared to be quite difficult for the participants and adjustments in instruction are warranted. One practical way of making adjustments is the Six-Week Rule (Koppenhaver & Erickson, 2009). After six weeks of attempting any instructional approach, a teacher is encouraged to examine the progress of the student. If the child is making progress with the instruction, this is a good point to augment the instruction. If the child is failing to make progress, this is a good time to make substantial changes. An additional way of addressing changes in instruction is accounted for in single subject experimental designs. Some single subject experimental designs allow for necessary adjustments when the intervention has no effect on the targeted skills (Tawney & Gast, 1984). For example, with Jack's limited background in letter names and sounds and limited progress in the study, a change in his instruction is needed. Since all four participants are within the partial alphabetic stage, an approach that places greater

emphasis on individual letters and their sounds would likely prove beneficial. At this stage, children are often using the beginning and ending letters for spellings and pronunciations, and reading words by making connections with some of the letters seen in the words. This is indicative of the performance demonstrated by the four participants.

To address issues of the application of evidence-based practice more broadly, Ylvisaker et al. (2002), advocated for a clinical approach based on concrete decision-making that is not limited solely to scientific research evidence. This decision-making is based upon multiple forms of evidence including educators' knowledge of students, observations, and student characteristics. Finally, the qualitative error analysis used in this study represents another type of evidence. It reveals the study participants' gradual but inconsistent progress that is often found in children as they learn to negotiate letters and their relationship to sounds in spelling.

Word-making and Sorting

Two steps to the Making Words instruction involved word-making and sorting. In word- making, a limited set of letters was used to spell a series of 8 to 11 words. These words were then sorted by rime patterns. Positive slope lines during the word-making and sorting steps indicated that the participants were engaged and understood the strategy. The sorting step, in particular, requires the student to visually identify and sort words with the same orthographic patterns. Three of the participants had positive slopes which indicated a greater attention to the words. Kate's negative slope may be attributed to a number of issues. She often struggled to remain focused during the instruction and regularly reminded me of her reward at the end of the session. Based on her previous instruction, the level of attention

to the words that is required for sorting was a new concept for her. Her engagement and effort were sporadic.

Cognition

Cupples and Iacono (2002) have demonstrated the ability of students with intellectual disabilities to learn from and apply phonics-based word instruction that used an onset-rime approach. The daily trend lines in the word-making and sorting steps of the current study seem to indicate that all four participants understood the instructional strategy and were making gains in skill levels. They were maintaining a greater attention to the steps and cues in the strategy, and fewer negative behaviors were being exhibited. When attention is directed away from negative behaviors, more attention can be placed on the ability to learn and apply the phonics-based word instruction.

Behaviors

Occasional behavioral issues with each of the participants seemed to demonstrate a number of issues. Based on record reviews, observations, teacher interviews, and informal information from the principal, the four participants have received little literacy instruction, particularly phonics instruction. While a complete educational record of the strategies used with each participant was unavailable, it is clear that each participant had developed methods for avoiding difficult or challenging tasks. This repertoire seemed to indicate patterns of learned helplessness. Each participant tried a variety of tactics to sidetrack the lessons including: (a) continual asking of questions that were irrelevant to the task at hand, (b) putting heads down, (c) grunting and words of anger, (d) pretending to be asleep, (e) requiring a reward before being willing to work, and (f) diverting the conversation to home

or school events and occurrences. Over the course of the study, these behaviors decreased. The lower number of behaviors can be attributed to several factors.

First, the participants became familiar with the process. The participants knew what time they would work with me, where they would be working, and how long it would take to complete the work. Over the duration of the study, the participants became more familiar with the instruction. As the word-making, sorting, and transfer steps became more familiar, fewer questions were necessary.

Second, participants became familiar with the expectations. As the participants learned that I would not be deterred from the task at hand, fewer issues occurred. Rosenthal and Jacobson (1968) accounted for the Pygmalion effects in the classroom. In his work, he found that when educators established high expectations to the students, the students rose to the occasion and performed at this higher level. A decrease in behaviors may be contributed to these same sort of effects. Each participant became more focused throughout the study.

Third, participants began to experience success. Whether it was correctly spelling a word without prompting, choosing the correct rime and spelling the word, or completing the *Making Words* lesson, success resulted in decreased misbehavior and off-task behavior. For example, when Mark successfully made a two-letter word at the beginning of the lesson, he celebrated by saying, "Woo hoo! Go, Mark!" As he experienced success over time, he displayed less anxiety when he did make a mistake. Rather than focusing on his error for several minutes as he had done early in the study, Mark learned to move on to the next word.

Success led to decreased interest in rewards by some participants. For example, Kate sought rewards throughout the study, but Mark's interest in rewards gradually faded during the study as he seemed to take pride in his own successful performance. Educators must

form a rapport with students, be accepting of challenges, and be inventive problem solvers, so that students such as these are able to experience success early and often. The importance of success for students who have historically experienced difficulties with learning cannot be overemphasized. For the participants in this study, success led to a better understanding of the strategy and more effort put forth by the participants. This, in turn, seemed to lead to greater interest and more confidence in their performance.

Limitations

Limitations of the present study include the mismatch of intervention task to participant knowledge, instructional design issues, participants' limited preexisting literacy learning opportunities, study duration, sample size, research site, and measurement issue. Each is addressed individually below.

Matching Intervention Task to Participant Knowledge

The *Making Words* strategy employed in this study assumed a deeper knowledge of letters and sounds than the participants in this study had attained. The lessons required the participants to sort and transfer based on rime patterns, while they had not yet learned to sort and transfer based on initial consonant patterns (Morris, Bloodgood, Lomax, & Perney, 2003). Modifying the *Making Words* strategy to include a sorting and transfer step focused on onsets would better match the skill level of the participants in this study. An existing curriculum that already provides such instruction is found in *Systematic Sequential Phonics They Use* (Cunningham, 2000). The first 30 lessons place an emphasis on beginning sounds in the sorting and transfer steps.

Instructional Design

The *Making Words* strategy was developed for students who are typically developing in a regular classroom. As such, the instruction took place according to its design with no modifications to the format. For each lesson, participants had the opportunity to (a) make a range of 8 to 11 words, (b) sort a range of 2 to 11 words, and (c) spell 3 new words. This may not have provided enough practice with the targeted rimes, particularly in the transfer step where only three words were spelled per lesson. Future studies may benefit by increasing the number of words spelled with a given pattern in the word-making step, which would then increase the number of words to sort. Likewise, an increase in the number of words spelled in the transfer step would allow for additional practice within each lesson. Children with DS, as well as any child with a limited literacy background, may benefit from such increased practice in the context of each lesson.

Limited Preexisting Literacy Learning Opportunities

Unlike the children in the study by Cupples and Iacono (2002), the four participants in this study were not in a mainstreamed school with a history of literacy instruction, including sight word and phonics instructional approaches. Instead, they were in a separate school where the learning environment had little academic focus. Their previous word instruction was limited primarily to sight word instruction. Each participant would likely benefit from word instruction that included both sight word and phonics instruction. This spelling-based phonics instructional strategy represents one piece of word instruction and one part of a more comprehensive approach to literacy instruction. Word instruction, alone, should not represent the entirety of literacy instruction.

After completing screening procedures, there were no participants that met the initial criteria for the study. An assumption was made, incorrectly, that the difficulty was with the particular assessment instruments. Instead, what proved to be the case was the participants possessed more basic letter-sound knowledge than the proposed instruction required. The participants' limited literacy learning opportunities and inability to meet the initial criteria for the study suggests a more basic approach, such as *Systematic Sequential Phonics They Use* (Cunningham, 2000), would have provided a better match between instructional level and knowledge of the participants.

The fact that four young adults, ages 16-21 years old, who had been attending school since age five, would possess such rudimentary understanding of letters and sounds suggests that literacy instruction had been particularly lacking. Typically developing children acquire a deeper understanding at much younger ages than these participants through a rich variety of experiences with songs, poetry, storybooks, and direct instruction in phonics and spelling. In contrast, these four participants had received direct instruction in sight words with little instruction of any other type. This is consistent with the extant literature, which reports no studies of systematic phonics instruction involving children with intellectual disabilities (Joseph & Seery, 2004).

Study Duration

The established time frame for this study may have been insufficient for participants to demonstrate substantial learning. Word instruction took place over a period of five weeks, with 9-10 hours of total instructional time, for participants with limited literacy backgrounds. Despite the limited amount of instructional time, the participants demonstrated positive trends in their learning. Given the school context and the previous limited learning

experiences, an expanded intervention over a greater amount of time would increase the possibility of greater learning outcomes. As well, this study was conducted at the end of the school year. This timing resulted in occasional rescheduling of sessions, a one-week lapse for a spring break, and some rescheduling of sessions due to special events (i.e., end of year awards, field day, Special Olympics). It is likely all of these interruptions contributed to decreased engagement and attention by the participants.

Sample Size

Because of the limited number of phonics instruction studies with children with DS, exploratory case studies of this nature are clearly warranted. However, the small sample size of four participants limits generalization. As a result, group statistics that might compare pretest and posttest results are not feasible. While each participant's data can be compared from pre- to posttest, the small sample size does not allow for further analysis of the instructional strategy across participants with varying experiences. A similar study on a larger scale with groups of closely matched participants would extend the findings of the current study.

Research Site

The self-contained school for participants with intellectual disabilities had inherent challenges in and of itself. This separate setting results in the students having limited or no contact with or modeling from peers who are typically developing. The lack of appropriate social models may have contributed to some of the inappropriate behaviors that occurred during the study. As well, the seemingly limited experience with academic work created a number of issues in the study. Participants had to become accustomed to this one-on-one, intensive instruction in their school day. Remaining focused on the instruction, which

averaged 25 minutes, proved to be a challenge. All four of these high school-aged participants were at early stages of reading and spelling development, suggesting an instructional program insufficient to meet their learning needs.

Measuring Growth

The measurement tools used in this study were designed for use with students who are typically developing and, theoretically, should have been applicable to students with DS. Some of the measures were not sensitive enough to measure the growth that occurred with each participant in this study. This may be due to the short duration of the study, the participants' limited literacy learning experiences, and the mismatch of assessments to the participants' developmental spelling levels.

In addition, the changes that occurred in the criteria for participation in the study may have affected the measurement of growth. The reexamined criteria included the selection of students that demonstrated measurable literacy skills that were indicative of learning potential. This resulted in the identification of four participants who had some understanding of letter-sounds, and three of the four participants being able to identify most of the letters in the alphabet screening. This meant that the participants had significantly lower developmental levels than what was being sought in the initial screening criteria.

Another possibility is that the measures did not capture what *Making Words* teaches. The word-making step focuses on letter-sounds and blending letters. During this step, students are practicing partial segmentation and blending of words. As students sort words, their attention is being drawn to high-frequency, orthographic patterns. The transfer step provides students with the opportunity to use familiar letters and patterns so that an unfamiliar, new word can be decoded and spelled. While all measures related back to these

specific areas, a different battery of tests including letter identification and letter-sound measures, may have been more sensitive to growth.

While previously used in a study with children with DS (See Cupples & Iacono, 2000, 2002) the segmentation task appeared to be the most difficult task for the participants for several reasons. The QRI, QIWK, Z Test, and Reading and Spelling of Taught and Untaught words featured two common tasks for children: reading words and spelling words. However, the segmentation task was more abstract. Children were representing the individual sounds in words with blocks. This was clearly an unfamiliar task, as it would be to most children. Even with demonstration and examples, the participants still had difficulty with the task.

The periodic checks represented a randomized sampling of rimes that occurred within the study. Modestly increasing the number of words read and spelled each week would provide additional data without compromising the time efficiency of the periodic checks.

Implications for Future Research

This study examined the effects of a spelling-based phonics approach on word instruction with four participants in a separate school. With limitations identified, there are also a number of future directions that seem warranted.

Design

A more sophisticated case study design could supply further understanding of the effectiveness of the spelling-based phonics approach. The case study design employed in this study was exploratory in nature. An A-B single-subject design has been successfully used in a variety of educational settings, including special education (Richards, Taylor, Ramasamy, & Richards, 1999; Tawney & Gast, 1984), to study behavior modification, sight

word instruction, and life skills instruction. The essence of this design lies in the ability to examine changes over time as a result of the intervention. The ability to use this design with a small number of children is advantageous in working with children with DS for several reasons, including the relatively low incidence of the population and limitations of resources due to wide ranges in geographical locations.

Broader Context

This study could be extended by embedding it within a larger literacy context throughout the school day. Specific, isolated interventions have often been used within the field of special education and continue to be modeled in intervention models, such as Response-To-Intervention. This type of intervention may be successful with regular education students since it occurs with a population of students who have broader experiences in their backgrounds and comprehensive literacy instruction in their school day. Isolated interventions may not see a high rate of success in special populations unless they occur in an environment where literacy instruction takes place throughout the school day.

Instructional Delivery

With the flexibility of the instructional delivery of *Making Words*, the approach could be used within an inclusive environment. Small group instruction with peers who are typically developing would provide a supportive, educational inclusion opportunity. Peers often serve dual roles. Not only do they provide socially and behaviorally appropriate models, but also provide models of how to do the sorting and transfer steps of *Making Words* itself.

Educational Leaders

Educational leaders establish the atmosphere and expectations for schools and school districts. This study highlights for principals and superintendents the importance of providing high quality literacy instruction to all children. While previous administrators at the school where this study was conducted clearly had a limited view of what children with DS were capable of, the current principal was embarking on a mission for change. She was actively seeking feedback and information on literacy instruction from me and searching for ways to fund needed changes. For example, she chose to spend her allotment of excess funds at the end of the school year on sets of paperback books for each classroom.

In-service education can support literacy initiatives within schools (Borko, 2004). This particular principal's perspective on students with disabilities was evolving toward one of optimism as she brainstormed and carried out almost monthly educational programs in literacy instruction and assessment. At the conclusion of the study, she was continuing to plan future literacy workshops for the teachers in the school. Her greater awareness of high quality literacy instruction has changed her approach within the school.

Finally, teacher preparatory programs, both regular and special education, can inform students better how to teach literacy to children with disabilities. A program with strong methods and an emphasis on problem-solving for differently-abled students will provide teachers with the necessary tools to effectively teach all aspects of literacy. This will help facilitate instruction that meets the needs of all children.

Summary

This study sought to explore the effects of a research-based approach to word instruction in children with DS. Historically, children with intellectual disabilities in self-

contained settings have received little, if any, comprehensive literacy instruction (Koppenhaver, 1991; Mike, 1995). Although the long-term benefits of phonics instruction have been noted (Conners, 1992; Joseph & Seery, 2004), teaching words in isolation through sight word instruction has been a predominant method for students with intellectual disabilities (Browder & Lalli, 1991; Conners, 1992; Koppenhaver, 1991). Research to date has not provided any evidence basis for eliminating phonics instruction with students who have DS. Rather, at least two studies (Cupples & Iacono, 2002; Groen et al., 2006) have shown the contrary. Indeed, phonics approaches can provide greater long-term benefits for children with moderate intellectual disabilities (Conners, 1992; Joseph & Seery, 2004) by increasing independence in decoding and spelling and increasing the possibility of reading and writing more widely and successfully. The data from the current study reveal the participants' growing understanding of the approach and gradual developmental progression in reading and spelling words. This instructional strategy represents one possible method for teaching children with DS. Further studies are needed to explore more efficient and effective means of delivering such instruction.

References

Abbeduto, L., Warren, S. F., & Conners, F. A. (2007). Language development in Down syndrome: From the prelinguistic period to the acquisition of literacy. *Mental Retardation and Developmental Disabilities, 13,* 247-261.

Abbott, M. (2001, October). Effects of traditional versus extended word-study spelling instruction on students' orthographic knowledge. *Reading Online, 5*(3). Available: http://www.readingonline.org/articles/art_index.asp?HREF=abbott/index.html

Al Otaiba, S., & Hosp, M. K. (2004). Providing effective literacy instruction to students with Down syndrome. *Teaching Exceptional Children, 36*, 28-35.

Adams, M. J. (1990). *Beginning to read*. Cambridge, MA: MIT Press.

Ball, E. W., & Blachman, B. A. (1991). Does phoneme awareness training in Kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly, 26*, 49-66.

Barlow, D. H., Nock, M. K., & Hersen, M. (2009). *Single case experimental designs: Strategies for studying behavior change*. Boston, MA: Pearson.

Baron, J. (1979). Orthographic and word specific mechanisms in children's reading of words. *Child Development, 50*, 60-72.

Bear, D. R., Invernizzi, M., Templeton, S., & Johnston, F. (1996). *Words their way: Word study for phonics, vocabulary, and spelling instruction*. Upper Saddle River, NJ: Merrill.

Blachman, B. A. (1997). Early intervention and phonological awareness: A cautionary tale. In B. Blachman (Ed.), *Foundations of reading acquisition and dyslexia*. Mahwah, NJ: Lawrence Erlbaum.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*, 3-15.

Bracey, S., Maggs, A., & Morath, P. (1975). The effects of a direct phonics approach in teaching reading with six moderately retarded children: Acquisition and mastery learning stages. *Exceptional Child, 22*, 83-90.

Broadley, I., & MacDonald, J. (1993). Teaching short term memory skills to children with Down's syndrome. *Down Syndrome Research and Practice, 1*, 56-62.

Browder, D. M. (2001). *Curriculum and assessment for students with moderate and severe disabilities*. New York, NY: The Guilford Press.

Browder, D. M., Courtade-Little, G., Wakeman, S., & Rickelman R. J. (2006). From sight words to emerging literacy. In D. M. Browder & F. Spooner (Eds.), *Teaching language arts, math and science to students with significant cognitive disabilities* (pp. 63-92). Baltimore MD: Paul H. Brookes.

Browder, D. M., & Lalli, J. S. (1991). Review of research on sight word instruction. *Research in Developmental Disabilities, 12*, 203-228.

Browder, D. M., & Xin, Y. P. (1998). A meta-analysis and review of sight word research and its implications for teaching functional reading to individuals with moderate and severe disabilities. *The Journal of Special Education, 32*, 130-153.

Buckley, S. (1985). Attaining basic educational skills: Reading, writing, and number. In D. Lane & B. Stratford (Eds.), *Current approaches to Down's syndrome* (pp. 315-343). London: Holt, Rinehart, & Winston.

Buckley, S. (1995). Teaching children with Down syndrome to read and write. In L. Nadel & D. Rosenthal (Eds.), *Down syndrome: Living and learning in the community* (pp. 158-169). New York, NY: Wiley-Liss, Inc.

Byrne, B. (1993). Learning to read in the absence of phonemic awareness? A comment on Cossu, Rossini, and Marshall (1993). *Cognition, 48*, 285-288.

Carroll, J. B., Davies, P., & Richman, B. (1971). *Word frequency book*. New York, NY: American Heritage.

Conners, F. A. (1992). Reading instruction for students with moderate mental retardation: Review and analysis of research. *American Journal on Mental Retardation, 96*, 577-597.

Conners, F. A. (2003). Reading skills and cognitive abilities of individuals with mental retardation. *International Review of Research in Mental Retardation, 27*, 191-229.

Conners, F. A., Rosenquist, C. J., Sligh, A. C., Atwell, J. A., & Kiser, T. (2006). Phonological reading skills acquisition by children with mental retardation. *Research in Developmental Disabilities, 27*, 121-137.

Cossu, G., Rossini, F., & Marshall, J. C. (1993). When reading is acquired but phonemic awareness is not: A study of literacy in Down's syndrome. *Cognition*, *46*, 129-138.

Cunningham, J. W. (1993). Whole-to-part reading diagnosis. *Reading and Writing Quarterly: Overcoming Learning Difficulties, 9*, 31-49.

Cunningham, J. W., & Creamer, K. H. (2009). *Investigating first graders' decoding by pattern*. Manuscript submitted for publication.

Cunningham, J. W., Erickson, K. A., Spadorcia, S. A., Koppenhaver, D. A., Cunningham, P. M., Yoder, D. E., & McKenna, M. C. (1999). Assessing decoding form an onset-rime perspective. *Journal of Literacy Research, 31*, 391-414.

Cunningham, P. M. (1975/6). Investigating a synthesized theory of mediated word identification. *Reading Research Quarterly, 11*, 127-43.

Cunningham, P. M. (2000). *Systematic sequential phonics they use: For beginning readers of any age*. Greensboro, NC: Carson-Dellosa.

Cunningham, P. M. (2007). Best practices in teaching phonological awareness and phonics. In L. B. Gambrell, L. M. Morrow, & M. Pressley (Eds.), *Best Practices in Literacy Instruction, 3rd ed*. (pp. 159-177). New York, NY: Guilford Press.

Cunningham, P. M. (2009). *Phonics they use: Words for reading and writing* (5th ed.). Boston, MA: Allyn & Bacon.

Cunningham, P. M., & Allington, R. L. (2007). *Classrooms that work: They can all read and write* (4th ed.). Boston, MA: Allyn & Bacon.

Cunningham, P. M., & Cunningham, J. W. (1992). Making words: Enhancing the invented spelling-decoding connection. *The Reading Teacher, 46*, 106-115.

Cunningham, P. M., & Hall, D. P. (1994). *Making words*. Carthage, IL: Good Apple.

Cunningham, P. M., & Hall, D. P. (2009). *Making words first grade*. Boston, MA: Pearson.

Cunningham, P. M., Hall, D. P., & Sigmon, C. M. (1999). *The teacher's guide to the four blocks*. Greensboro, NC: Carson-Dellosa.

Cupples, L., & Iacono, T. (2000). Phonological awareness and oral reading skill in children with Down syndrome. *Journal of Speech, Hearing, and Language Research, 43*, 595-608.

Cupples, L., & Iacono, T. (2002). The efficacy of 'whole word' versus 'analytic' reading instruction for children with Down syndrome. *Reading and Writing: An Interdisciplinary Journal, 15*, 549-574.

Downing, J. E. (2005). *Teaching literacy to students with significant disabilities*. Thousand Oaks, CA: Corwin Press.

Edmark Reading Program. (1972). Belleveue, WA: Edmark Corporation.

Edmark Reading Program Software (1986). Belleveue, WA: Edmark Corporation.

Ehri, L. C. (1989). The development of spelling knowledge and its role in reading acquisition and reading disability. *Journal of Learning Disabilities*, *22*, 356-365.

Ehri, L. C. (1991). Development of the ability to read words. In R. Barr, M. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), Handbook of reading research (Vol. II, pp. 383-417). New York, NY: Longman.

Ehri, L. C. (1992). Reconceptualizing the development of sight word reading and its relationship to recoding. In P. B. Gough, L. C. Ehri, & Treiman, R. (Eds.), *Reading Acquisition* (pp. 107-144). Hillsdale, NJ: Lawrence Erlbaum.

Ehri, L. C. (1998). Grapheme-phoneme knowledge is essential for learning to read words in English. In J. Metsala & L. Ehri (Eds.), *Word recognition in beginning reading* (pp. 3-40). Mahwah, NJ: Erlbaum.

Elliott, C. D. (1990). *Differential Ability Scales*. San Antonio, TX: The Psychological Corporation.

Engelmann, S., & Bruner, E. (1969). *Distar Reading I, II*. Chicago: Science Research Associates.

Engelmann, S., & Osborn, J. (1969). *Distar Language I*. Chicago: Science Research Associates.

Engelmann, S., & Osborn, J. (1971). *Distar Language II*. Chicago: Science Research Associates.

Engelmann, S., & Osborn, J. (1972). *Distar Language III*. Chicago: Science Research Associates.

Engelmann, S., & Stearns, S. (1972). *Distar Reading III*. Chicago: Science Research Associates.

Erickson, K. A., Koppenhaver, D. A., & Yoder, D. E. (1994). *Literacy and Adults with Developmental Disabilities* (NCAL Tech. Report No. 94-15). Philadelphia, Pennsylvania: University of Pennsylvania, National Center on Adult Literacy.

Evans, R. (1994). Phonological awareness in children with Down's syndrome. *Down Syndrome Research and Practice, 2*, 102-105.

Farrell, M., & Elkins, J. (1994/1995). Literacy for all? The case of Down syndrome. *Journal of Reading, 38*, 270-280.

Fidler, D. J., Most, D. E., & Guiberson, M. M. (2005). Neuropsychological correlates of word identification in Down syndrome. *Research in Developmental Disabilities, 26*, 487-501.

Flanigan, K. (2007). A concept of word in text: A pivotal event in early reading acquisition. *Journal of Literacy Research, 39*, 37-70.

Fletcher, H., & Buckley, S. (2002). Phonological awareness in children with Down syndrome. *Down Syndrome Research and Practice, 8*, 11-18.

Fowler, A. E. (1990). Language abilities in children with Down syndrome: Evidence for a specific syntactic delay. In D. Cicchetti & M. Beeghly (Eds.), *Children with Down syndrome: A developmental perspective* (pp. 302-328). New York, NY: Cambridge University Press.

Fowler, A. E., Doherty, B. J., & Boynton, L. (1995). The basis of reading skill in young adults with Down syndrome. In L. Nadel & D. Rosenthal (Eds.), *Down syndrome: Living and learning in the community* (pp. 182-196). New York, NY: Wiley-Liss, Inc.

Francis, H. (1982). *Learning to read*. London, UK: George Allen & Unwin Publishers Ltd.

Friend, M. P., & Bursuck, W. D. (2002). *Including students with special needs: A practical guide for classroom teachers*. Boston, MA: Allyn-Bacon.

Gersten, R. M., & Maggs, A. (1982). Teaching the general case to moderately retarded children: Evaluation of a five year project. *Analysis and Intervention in Developmental Disabilities, 2*, 329-343.

Goetz, K., Hulme, C., Brigstocke, S., Carroll, J. M., Nasir, L., & Snowling, M. (2008). Training reading and phoneme awareness skills in children with Down syndrome. *Reading and Writing, 21*, 395-412.

Gombert, J. E. (2002). Children with Down syndrome use phonological knowledge in reading. *Reading and Writing: An Interdisciplinary Journal, 15*, 455-469.

Groen, M. A., Laws, G., Nation, K., & Bishop, D. V. M. (2006). A case of exceptional reading accuracy in a child with Down syndrome: Underlying skills and the relation to reading comprehension. *Cognitive Neuropsychology, 23*, 1190-1214.

Hall, D. P., & Cunningham, P. M. (1996). Becoming literate in first and second grades: Six years of multimethod, multilevel instruction. In D. J. Leu, C. K., Kinzer, & K. A. Hinchman (Eds.), *Literacies for the 21st century: Research and practice* (pp. 195-204). 45th yearbook of the National Reading Conference. Chicago, IL: The National Reading Conference.

Hancock, D. R., & Algozzine, R. (2006). *Doing case study research: A practical guide for beginning researchers*. New York, NY: Teachers College Press.

Hays, P. A. (2004). Case study research. In K. deMarrais & S. D. Lapan (Eds.), *Foundations of Research* (pp. 217-234). Mahwah, NJ: Lawrence Erlbaum Associates.

Hedrick, W. B., Katims, D. S., & Carr, N. J. (1999). Implementing a multimethod, multilevel literacy program for students with mental retardation. *Focus on Autism and Other Developmental Disabilities, 14*, 231-239.

Henderson, E. H. (1990). *Teaching spelling* (2nd ed.). Boston: Houghton Mifflin.

Henderson, E. H. (1992). The interface of lexical competence and knowledge of written words. In S. Templeton & D. R. Bear (Eds.), *Development of orthographic knowledge and the foundations of literacy*. Hillsdale, NJ: Erlbaum.

Hoogeveen, F. R., Kouwenhoven, J. A., & Smeets, P. M. (1989). Establishing sound blending in moderately mentally retarded children: Implications of verbal instruction and pictorial prompting. *Research in Developmental Disabilities, 10*, 333-348.

Hoogeveen, F. R., & Smeets, P. M. (1988). Establishing phoneme blending in trainable mentally retarded children. *Remedial and Special Education, 9*, 46-53.

Hoogeveen, F. R., Smeets, P. M., & Lancioni, G. E. (1989). Teaching moderately mentally retarded children basic reading skills. *Research in Developmental Disabilities, 10*, 1-18.

Hoogeveen, F. R., Smeets, P. M., & van der Houven, J. E. (1987). Establishing letter-sound correspondences in children classified as trainable mentally retarded. *Education and Training in Mental Retardation, 22*, 77-84.

Horner, R. D., & Baer, D. M. (1978). Multiple-probe technique: A variation of the multiple baseline. *Journal of Applied Behavior Analysis, 11*, 189-196.

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71*, 165-179.

Hunt, N. (1967). *The world of Nigel Hunt: The diary of a mongoloid youth*. New York, NY: Garrett Publications.

Invernizzi, M., Meir, J. D., Swank, L., & Juel, C. (2003a). *Phonological awareness literacy screening for kindergarten (PALS-K): Administration and scoring guide*. Charlottesville: University of Virginia Printing.

Invernizzi, M., Meir, J. D., Swank, L., & Juel, C. (2003b). *Phonological awareness literacy screening for kindergarten (PALS-K): Technical reference*. Charlottesville: University of Virginia Printing.

Joseph, L. M., & Seery, M. E. (2004). Where is the phonics? *Remedial and Special Education, 25*, 88-94.

Katims, D. S. (2000). *The quest for literacy: Curriculum and instructional procedures for teaching reading and writing to students with mental retardation and developmental disabilities*. Reston, VA: The Council for Exceptional Children, Division on Mental Retardation and Developmental Disabilities. (ERIC Document Reproduction Service No. ED445454)

Kennedy, C. H. (2005). *Single-case designs for educational research*. Boston, MA: Pearson.

Kennedy, E. J., & Flynn, M. C. (2003a). Early phonological awareness and reading skills in children with Down syndrome. *Down Syndrome Research and Practice, 8*, 100-109.

Kennedy, E. J., & Flynn, M. C. (2003b). Training phonological awareness skills in children with Down syndrome. *Research in Developmental Disabilities, 24*, 44-57.

Koppenhaver, D. A. (1991). A descriptive analysis of classroom literacy instruction provided to children with severe speech and physical impairments (Doctoral dissertation, University of North Carolina, 1991). *Dissertation Abstracts International, 53*, 157.

Koppenhaver, D. A., & Erickson, K. A. (2009). Literacy in individuals with autism spectrum disorders who use AAC. In P. Mirenda & T. Iacono (Eds.), *Autism spectrum disorders and AAC* (pp. 385-412). Baltimore, MD: Paul H. Brookes.

Leitao, S., Hogben, J., & Fletcher, J. (1997). Phonological processing skills in speech and language impaired children. *European Journal of Disorders of Communication, 32*, 73-93.

Leslie, L., & Caldwell, J. (2001). *Qualitative Reading Inventory-3*. New York, NY: Addison Wesley Longman.

Marsh, G., Desberg, P., & Cooper, J. (1977). Developmental changes in reading strategies. *Journal of Reading Behavior, 9*, 391-394.

Meyers, L. F. (1990). Language development and intervention. In D. C. Van Dyke, D. J. Lang, F. Heide, S. Van Duyne, & M. J. Soncek (Eds.), *Clinical perspectives in the management of Down syndrome* (pp. 153-164). New York, NY: Springer-Verlag.

Mike, D. G. (1995). Literacy and cerebral palsy: Factors influencing literacy learning in a self-contained setting. *Journal of Literacy Research, 27*, 627-642.

Moni, K., & Jobling, A. (2000). Poetry and young adults with Down syndrome. *Social Alternatives, 19*, 36-39.

Morgan, M., Moni, K. B., & Jobling, M. A. (2006). Code breaker: developing phonics with a young adult with an intellectual disability. *Journal of Adolescent & Adult Literacy, 50*, 52-65.

Morris, D. (1993). The relationship between beginning readers' concept of word in text and phoneme awareness in learning to read: A longitudinal study. *Research in the Teaching of English, 27*, 133-154.

Morris, D. (2005). *The howard street tutoring manual* (2nd ed.). New York, NY: Guilford Press.

Morris, D., Bloodgood, J. W., Lomax, R. G., & Perney, J. (2003). Developmental steps in learning to read: A longitudinal study in kindergarten and first grade. *Reading Research Quarterly, 38*, 302-328.

Morton, J., & Frith, U. (1993). What lesson for dyslexia from Down's syndrome? Comments on Cossu, Rossini, and Marshall (1993). *Cognition, 48*, 289-296.

National Down Syndrome Society (2008). *About Down syndrome: Myths and truths*. Retrieved October 2, 2008, from http://www.ndss.org/index.php?option=com_content&view=article&id=59&Itemid=76

National Institute of Child Health & Human Development (2000). Report of the National Reading Panel. *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implication for reading instruction: Reports of the subgroups* (NIH Publication No. 00-4754). Washington, DC: U. S. Government Printing Office.

O'Connor, R. E., Notari-Syverson, A., & Vadasy, P. F. (1996). Ladders to literacy: The effects of teacher-led phonological activities for kindergarten children with and without disabilities. *Exceptional Children, 63*, 117-130.

Oelwein, P. L. (1995). *Teaching reading to children with Down syndrome: A guide for parents and teachers*. Bethesda, MD: Woodbine House.

Patterson, D., & Lott, I. (2008). Etiology, diagnosis, and development in Down syndrome. In J. E. Roberts, R. S. Chapman, & S. F. Warren (Eds.), *Speech and language development and intervention in Down syndrome and Fragile X syndrome* (pp. 3-25). Baltimore, MD: Paul H. Brookes.

Perfetti, C. A. (1985). *Reading ability*. New York: Oxford Press.

Perfetti, C. A. (1986). Continuities in reading acquisition, reading skill, and reading disability. *Remedial and Special Education, 7*, 11-21.

Perfetti, C. A. (1992). The representation problem in reading acquisition. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 145-174). Mahwah, NJ: Erlbaum.

Raynor, K., & Pollatsek, A. (1989). *The psychology of reading*. Englewood Cliffs, NJ: Prentice Hall.

Richards, S. B., Taylor, R. L., Ramasamy, R., & Richards, R. Y. (1999). *Single subject research: Applications in educational and clinical settings*. San Diego, CA: Singular Publishing.

Roch, M., & Jarrold, C. (2008). A comparison between word and nonword reading in Down syndrome: The role of phonological awareness. *Journal of Communication Disorders, 41*, 305-318.

Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom*. New York, NY: Holt, Rinehart, and Winston.

Schlagal, B. (2007). Best practices in spelling and handwriting. In S. Graham, C. A. MacArthur, and J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 179-201). New York, NY: Guilford Press.

Schlagal, R. C. (1989). Constancy and Change in spelling development. *Reading Psychology, 10*, 207-232.

Seltzer, M. M., & Krauss, M. W. (1999). Families of adults with Down syndrome. In J. F. Miller, M. Leddy, & L. A. Leavitt (Eds.), *Improving the communication of people with Down syndrome* (pp. 217-240). Baltimore, MD: Paul H. Brookes.

Share, D. L. (1995). Phonological recoding and self-teaching: sine qua non of reading acquisition. *Cognition, 55*, 151-218.

Snowling, M. J., Hulme, C., & Mercer, R. C. (2002). A deficit in rime awareness in children with Down syndrome. *Reading and Writing: An Interdisciplinary Journal, 15*, 471-495.

Stahl, S. A., Duffy-Hester, A. M., & Stahl, K. A. (1998). Everything you wanted to know about phonics (but were afraid to ask). *Reading Research Quarterly, 33*, 338-355.

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications.

Stuart, M., & Coltheart, M. (1988). Does reading develop in a sequence of stages? *Cognition, 30*, 139-181.

Tawney, J. W. & Gast, D. L. (1984). *Single-subject research in special education*. Columbus, OH: Bell & Howell Company.

Thorndike, R. L., Hagen, E. P., & Sattler, J. M. (1986). *Stanford-Binet Intelligence Scale, Fourth Edition*. Itasca, IL: Riverside Publishing Company.

True Random Number Service. (1998). *Random Integer Generator*. Retrieved May 7, 2009 from http://www.random.org/integers/?num=65&min=1&max=16&col=5&base=10&format=html&rnd=new

U. S. Department of Education, Special Education and Rehabilitative Services (2007). *Thirty years of progress of educating children with disabilities through IDEA*. Retrieved October 2, 2008, from http://www.ed.gov/policy/speced/leg/idea/history30.html

van Bysterveldt, A. K., Gillon, G. T., & Moran, C. (2006). Enhancing phonological awareness and letter knowledge in preschool children with Down syndrome. *International Journal of Disability, Development and Education, 53*, 301-329.

Verucci, L., Menghini, D., & Vicari, S. (2006). Reading skills and phonological awareness acquisition in Down syndrome. *Journal of Intellectual Disability Research, 50*, 477-491.

Walsh, B. F., & Lamberts, F. (1979). Errorless discrimination and picture fading as techniques for teaching sight words to TMR students. *American Journal of Mental Deficiency, 83*, 473-479.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children, Third Edition*. San Antonio, TX: The Psychological Corporation.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children, Fourth Edition*. San Antonio, TX: The Psychological Corporation.

Woodcock, R. W., & Mather, N. (1989). *Woodcock Johnson Tests of Cognitive Ability*. Allen, TX: DLM Teaching Resources.

Wylie, R. E., & Durrell, D. D. (1970). Teaching vowels through phonograms. *Elementary English, 47*, 787-791.

Yin, R. K. (1994). *Case study research: design and methods (2nd ed.)*. Thousand Oaks, CA: Sage Publications.

Yin, R. K. (2009). *Case study research: design and methods (4th ed.)*. Thousand Oaks, CA: Sage Publications.

Ylvisaker, M., Coelho, C., Kennedy, M., Sohlberg, M. M., Turkstra, L., Avery, J., & Yorkston, K. (2002). Reflections on evidence-based practice and rational clinical decision making. *Journal of Medical Speech-Language Pathology, 10*, 15-33.

Zeno, S. M., Ivens, S. H., Millard, R. T., & Duvvuri, R. (1995). *Educator's word frequency guide*. United States of America: Touchstone Applied Science Associates.

APPENDIX A

Sample Lesson (adapted from Edmark Reading Program)

Sample Lesson

Below is a lesson similar to those found in the Edmark Reading Program. During the study, I observed the participants completing a lesson that was adapted for use with three students. The teacher had two typed pages with the words and distracter words in rows on the page. For example, one row may contain the key vocabulary word. The second row may contain this key vocabulary word and two distracter words. The distracter words may be real words from previous lessons or non-words.

"Teacher: First, we are going to take turns reading some review words. Jack, you go first and read one word. Then, Mark and Chrissy can read a word (Note: Chrissy was not a part of the intervention study).

Jack: "Do."

Mark: "Green."

Chrissy: "Dog."

Teacher: "Now, we are going to learn a new word. This is the word, *cow*. What is this word, Jack?"

Jack: "Cow." The teacher continues by asking each student to read the new word. Once this is completed, the teacher points to a row of words and non-words and asks each student to point to the word, *cow*. This row also contains two previous key vocabulary words, *green* and *dog*. Then, the teacher points to the next row which contains the word, cow.

Teacher: "What is this word, Jack?" She then asks each student to read the word. The next row contains the new word and previous key words (e.g., *green*, *cow*, and *dog*). The teacher asks each student to read a word in the row.

Teacher: "Can you read the first word in this row, Jack?" Jack reads the word, *green*. Each student takes turns reading words in this row. A similar format is carried out until students have the opportunity to read phrases containing the key words (e.g., *the green cow*).

APPENDIX B

Permission from Institutional Review Board

To: David Koppenhaver

College of Education

CAMPUS MAIL

From: _____

Julie Taubman, Institutional Review Board

Date: 7/07/2009

RE: Change in Status from Exempt to Expedited

Study #: 09-0195 **Study Title**: A Spelling-Based Phonics Approach to Word Instruction for Children with Down Syndrome

Submission Type: Initial

The study referenced above was granted exempt status shortly after its submission on 3/13/2009. Subsequent review by the IRB Office indicates that according to Federal guidelines, the proposal should have been granted an expedited approval instead, due to the involvement of surveys or interviews of children. That expedited approval is granted with this letter.

The change in status will have no effect on your conducting or reporting your study, **unless your study (data collection or analysis) continues 1 year beyond the date of your exempt notification letter, in which case you will need to apply for a Renewal of IRB Approval.** The form can be found at http://www.orsp.appstate.edu/compliance/irb/index.php and should be submitted electronically by clicking the "Submit by Email" button at the top of the form.

If we do not receive a renewal application within 14 days, we will assume the project has been completed, and will terminate the IRB expedited approval. I apologize for any inconvenience this oversight may have caused. Please call me at 262-7981 if you have any questions.

CC:

Amy Williams

APPENDIX C

Permission from School System

[redacted] ***School***

[redacted]
Principal

[redacted]
Superintendent

March 17, 2009

Appalachian State University
Dr. Jay Cranston
Office of Research and Graduate Studies

Amy R. Williams has been granted permission to complete her dissertation study at [redacted] School in [redacted] County.

Sincerely,

[redacted]
EC Director

[redacted]
Superintendent

APPENDIX D

Letter to Parents or Guardians

March 24, 2009

Dear Parent of _____,

My name is Amy Williams and I am a doctoral student at Appalachian State University. As part of my graduate program, I am looking forward to pursuing an area of great interest to me and importance to your child with Down syndrome: literacy. I am requesting that you, your child's teacher, and the building principal give me permission to teach your child a new way to learn how to read and spell words. My research project is entitled "A Spelling-Based Phonics Approach to Word Instruction for Children with Down Syndrome."

This study will require me to teach your child for 20-30 minutes per day. I would see your child five times a week for seven weeks to conduct word instruction and reading and spelling assessments. All instruction and assessments will take place at a time that fits your child's and the teacher's schedule. I will work with your child's teacher so that my instruction does not affect other important instructional activities. I will need to videotape each intervention session in order to carefully study my teaching and your child's learning. All video will show the hands of your child and not faces. In addition, I would like to review your child's special education records in order to obtain information on age, diagnosis, intelligence and academic measures, and educational goals. Last, I will observe your child during class in order to better understand the materials, activities, and strategies that are used for instruction.

I will also need to check to see if your child sustains an understanding of the instruction once every two weeks for six weeks (3 visits) after the instruction and

assessments are completed. This will require me to set up meeting times of approximately 30 minutes that are most convenient to you over the summer break.

The data collected in this study will be used in completing my dissertation research. All data and information that I collect will be kept confidential and only viewed by those directly connected to this study. All data that is collected will be properly stored in a file cabinet in my home. When I write up this data for my dissertation, names will not be used in order to protect your child's privacy. There are no foreseeable risks to your child for this study. My hope is that your child's progress in reading and spelling words will help the teacher meet the individual needs of your child. If you choose for your child not to participate, there will be no negative consequences and your decision will not affect your child's academic progress. In addition, you are free to withdraw your child from this study at any time without penalty.

I appreciate the time you have taken to read about and consider your child's participation in this project. It will be a valuable learning experience for me and I hope that what I learn can be used to help not only your child but other students with Down syndrome as well. If you are willing for your child to participate, please complete, sign, and return the bottom portion of this letter to your child's teacher. If you have any questions, please feel free to contact me at 828-773-1824 or email me at williamsar@appstate.edu.

This research project has been approved, as required, by the Institutional Review Board of Appalachian State University, the [redacted] County Public Schools, and [redacted] School.

March 24, 2009 — IRB Approval Date

September 10, 2009 — Approval Expiration Date

Should you have any other questions about this study, you may contact Dr. Jay Cranston, IRB Administrator, Graduate Studies and Research, Appalachian State University, 828-262-2692 or irb@appstate.edu.
Sincerely,

Amy R. Williams

I understand this informed consent and give permission for my child,
_____,
to participate in this dissertation study.

Parent's Signature_____ Date _____

APPENDIX E

Letter to Teachers

March 24, 2009

Dear _____(Teacher),

My name is Amy Williams and I am a doctoral student at Appalachian State University. As part of my graduate program, I am looking forward to pursuing an area of great interest to me and importance to your child with Down syndrome: literacy. I am requesting that you, the parents/guardians of your student, and the building principal give me permission to teach your students. My research project is entitled "A Spelling-Based Phonics Approach to Word Instruction for Children with Down Syndrome."

This study will require me to work with your student(s) for 20-30 minutes per day. I would see each student five times a week for seven weeks to conduct word instruction and reading and spelling assessments. All instruction and assessments will take place at a time that fits your schedule and the student's schedule. I will work with you so that my instruction does not affect other important instructional activities. I will videotape each intervention session in order to carefully study my teaching and your student's learning. In addition, I will review your student's special education records in order to obtain information on age, diagnosis, intelligence and academic measures, and educational goals.

I will also need to check to see if your student sustains an understanding of the instruction once every two weeks for six weeks (3 visits) after the instruction and assessments are completed. This will require me to set up meeting times of approximately 30 minutes that are most convenient to the parents/guardians over the summer break.

During the study, I would like to observe the student(s) during classroom instruction. This will provide me with insight on the type of literacy materials, activities, and strategies that are used with the student(s).

I would also like to interview you as part of my study. The interview should take 15-20 minutes and will be scheduled at a time that is convenient to you. During the interview, I will ask you to respond to approximately three questions about instruction. The information that you provide will help me better understand the student's instruction. During the interview, I will take notes. I will transcribe the notes and ask you to review them for accuracy of information. Your name and responses will be kept confidential.

The data collected in this study will be used in completing my dissertation research. All data and information that I collect will be kept confidential and only viewed by those directly connected to this study. All data that is collected will be properly stored in a file cabinet in my home. When I write up this data for my dissertation, names will not be used in order to protect the student's privacy and your privacy. There are no foreseeable risks to the students for this study. My hope is that your student's progress in reading and spelling words will help you meet the individual needs of your student.

If you choose not to participate, there will be no negative consequences and your decision will not affect you. I appreciate the time you have taken to read about and consider your participation in this project. It will be a valuable learning experience for me and I hope that what I learn can be used to help not only your students but other students with Down syndrome as well. If you are willing to participate, please complete, sign, and return the bottom portion of this letter. If you have any questions, please feel free to contact me at 828-773-1824 or email me at williamsar@appstate.edu.

This research project has been approved, as required, by the Institutional Review Board of Appalachian State University and the [redacted] County Public Schools.

March 24, 2009 September 10, 2009

IRB Approval Date Approval Expiration Date

Should you have any other questions about this study, you may contact Dr. Jay Cranston, IRB Administrator, Graduate Studies and Research, Appalachian State University, 828-262-2692 or irb@appstate.edu.
Sincerely,

Amy R. Williams

I understand this informed consent and agree to participate in this dissertation study.

Teacher's Signature_____ Date _____

APPENDIX F

Sample Making Words Lesson

Sample Making Words Lesson

Below is a sample *Making Words* lesson suitable in a one-on-one setting with teacher directions and responses. The student and teacher each have the following lower case letters: a, e, g, m, n, s, t. The teacher has written all of the words on index cards.

Teacher: "Hold up and name each letter as I hold up my letter. Show me your a, e, g, m, n, s, and t. We have 7 letters in the lesson today. In a bit, we will try to make a word that uses all 7 letters."

Part 1: Word-making. "Use 3 letters to spell the word *eat*. We *eat* snack at school. *Eat*." After the child has chosen three letters and attempted to spell the word, the teacher displayed an index card with the word written on it. "This is how I spelled *eat*. Does yours look like mine?" Before the next word was presented, the student corrected any errors. This process continued as each word was presented.

"Now, change 1 letter and change the order of the letters to spell the word, *net*. I hit the ball over the *net*. *Net*." (Correct any errors).

"Now change the first letter in *net* to spell the word, *met*. I *met* my friend after school. *Met*." (Correct any errors).

"Change the first letter again to spell the word, *set*. She *set* the table for dinner. (Correct any errors).

"Add a letter that you can't hear to spell the word, *seat*. My *seat* is in the back of the room. *Seat*." (Correct any errors).

"Change the first letter in *seat* to spell *neat*. On Fridays, I clean up my desk so that it is *neat*. *Neat*." (Correct any errors).

"Change the first letter again to spell *meat*. Some people only eat vegetables only and not *meat*. *Meat*." (Correct any errors).

"Use the same letters in *meat* but move them around so that they spell *team*. What's your favorite basketball *team*?" (Correct any errors).

"Change one letter and move them around so that you use four letters to spell *east*. The sun rises in the *east*." (Correct any errors).

"Clear your letters in front of you. We are going to start over to spell another 4 letter word, *stem*. A rose has a long *stem*. *Stem*." (Correct any errors).

"Use a letter you can't hear to turn *stem* into *steam*. When water is heated, it turns into *steam*. *Steam*." (Correct any errors).

"I have just one word left that is the secret word that is made with all the letters. Can you figure it out?" If a student has difficulty, the teacher provided letters and allowed the student time between each clue to figure out the word. For example, the teacher said, "The first letter in the secret word is m." After several seconds, she provided an additional letter or letters until the student was able to figure out the word. For example, the teacher said, "The first letter is m. The next letter is a." This continued, with pauses between letters, until the student figured out the secret word or the teacher has named all the letters. In the above lesson, the secret word was *magnets*.

Part 2: Sorting the words into patterns. All of the index cards are placed in a pocket chart. "First we spelled the word, *eat*. E-a-t. We changed one letter to spell another 3-letter word, *net*. N-e-t. We changed the first letter to spell the word, *met*. M-e-t." This process continued until all the words from the word-making step were spelled aloud. Then, the teacher placed one of each set of rhyming words in the pocket chart. For this lesson, the

words placed in the pocket chart were: *net*, *seat*, and *team*. Then the teacher said, "I want you to find the other words that rhyme or sound alike and place them under the words." When the student completed the activity, the teacher and student read aloud each column of words. One column contained words that rhymed with *eat: seat, neat* and *meat*. A second column contained the word that rhymed with *team: steam*. The final column contained the words that rhymed with *net*: *met* and *set*. If any of the words were sorted incorrectly, the teacher participated in an exchange similar to the following: "Let's read the words that rhyme with *eat*. *Eat*, *seat*, *neat*, *meat*, and *set*. Hmmm. *Eat*, *seat*, *neat*, and *meat* all sound alike or rhyme. *Set* sounds different from *eat*, *seat*, *neat*, and *meat*. *Set*. *Eat*. They don't rhyme. What if we place the word, *set*, with the words, *met* and *net*. Let's try that. *Set*, *met*, and *net*. Yes, these words rhyme or sound alike."

Part 3: Transfer. During this step, the student was asked to spell words that rhymed with some of the words made in the lesson. Students were provided with paper and pencil or an adapted keyboard.

"Let's pretend that it's writing time at school and you want to write about your parents taking you out last night for a special *treat* of ice cream. You want to spell the word, *treat*. Let's stretch out *treat* and listen for the first two letters that we hear at the beginning of *treat*. Now, which word that we learned today would help us spell *treat*?" The student was given time to attempt the spelling. Then, an index card was held up with *treat* written on it. The teacher and student compared the word to the other columns of words (*eat-team-net*). "*Treat*. *Eat*. I think that these two words sound alike or rhyme. Both of these word have –*eat* in them. Let's try the other two words to make sure. *Treat*. *Team*. These don't sound alike and they have different endings. *–Eat and –eam*. Let's try this word, *net*. *Treat*. *Net*.

No, those two don't rhyme and have different endings. *Eat* and *–et*. Yes, *treat* and *eat* sound alike or rhyme and have the same ending."

The teacher continued with additional words. "What if we wanted to write about going fishing in the *stream*? You want to spell the word, *stream*. Let's stretch out *stream* and listen for the first three letters we hear at the beginning of *stream*. Now, which word that we learned today would help us spell *stream*?" The student was give time to attempt the spelling. The teacher held up an index card with *stream* written on it. The teacher and student compared the word to the other columns of words (*eat-team-net*). "*Stream*. *Eat*. These two words don't sound alike and they have different endings. *–Eam* and *–eat*. Let's try this word, *team*. *Stream*. *Team*. These two sound alike or rhyme. Both of these words have the *–eam* ending, too. Let's compare *stream* with our final word, *net*. *Stream*. *Net*. No, these two don't rhyme and they have different endings. *–Eam* and *–et*. *Stream* and *team*. These two sound alike or rhyme and have the same endings."

The teacher continued with a third word for this lesson. "What if we were writing about playing in the lawn sprinkler and getting *wet*? You want to spell the word, *wet*. Let's stretch out *wet* and listen for the first letter we hear at the beginning of *wet*. Now, which word that we learned today would help us spell *wet*?" The student was given time to attempt the spelling. Then, the teacher held up an index card with *wet* written on it. The teacher and student compared the word to the other columns of words (*eat-team-net*). "*Wet*. *Eat*. These two words don't sound alike and they have different endings. *–Et* and *–eat*. Let's try this word, *team*. *Wet*. *Team*. These two don't sound alike or rhyme and they have different endings. *–Et* and *–eam*. Let's compare *wet* with our final word, *net*. *Wet*. *Net*. Yes, these

two words rhyme and they have the same endings. *–Et*. *Wet* and *net*. These two sound alike or rhyme and have the same endings."

It is important to note the nature of error correction throughout the *Making Words* lesson. The teacher avoided terminology such as *incorrect* or *wrong*. Instead, each step maintained the integrity of the guided discovery approach (Cunningham & Hall, 2009). The teacher guided the student through each step of the lesson. By doing so, the student had the opportunity to compare and contrast responses with the letters or words from the lesson.

APPENDIX G

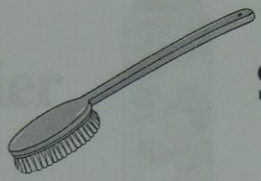
Samples of Tina's Independent Work


Mark the correct beginning sound in each box.
p s
p s
p s
p s
p s
p s
p s
p s
p s
p s
p s
p s
3

A. Find each product in the Drug Store Flyer.
B. Write the correct price of each product on the blank line.

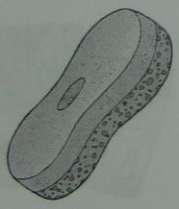
1. **Aspirin** 

$ $3.99 each

2. **Back Scrubber** 
$ $2.88 each

3. **Bandages** 

$ $2.95 each

4. **Bath Sponge** 
$ $1.19 each

5. **Birthday Card** 

$ $1.75 each

6. **Blow Dryer** 
$ $14.39 each

BIOGRAHICAL INFORMATION

Amy Renee Williams was born on November 10, 1974 in Morganton, North Carolina, to William Jerry and Ola Arlean Williams. She attended the Burke County Public Schools and graduated from Freedom High School in 1993. After graduating with a bachelor's degree in special education in 1998, she taught in the Ashe County Public Schools for ten years as a teacher of exceptional children. During this time, she earned a master's degree in reading and began teaching special education and literacy courses at Appalachian State University. She continued to pursue her education by enrolling in post-Masters courses in reading prior to entering the doctoral program in Educational Leadership with an emphasis on literacy and disabilities. While completing her degree, she served as a research assistant, adjunct faculty member, parental and school consultant, and tutor to children with disabilities. She received her degree in August 2010.